Vincent Brooks Day & Son Lith.

F786
.B45
1869
v.2

NEW TRACKS IN NORTH AMERICA.

A Journal of Travel and Adventure

WHILST ENGAGED IN THE SURVEY FOR A SOUTHERN RAILROAD TO THE PACIFIC OCEAN DURING 1867—8.

By WILLIAM A. BELL, M.A., M.B. Cantab.,

FELLOW OF THE ROYAL GEOGRAPHICAL AND ETHNOLOGICAL SOCIETIES.

The Teams at Eventide, California.

IN TWO VOLUMES.

VOL. II.

LONDON:
CHAPMAN AND HALL, 193, PICCADILLY.
1869.

MISSOURI
BOTANICAL
GARDEN.

[*All Rights Reserved.*]

LONDON:
PRINTED BY VIRTUE AND CO.,
CITY ROAD.

CONTENTS.

PART III.

FROM THE RIO GRANDE DEL NORTE TO THE PACIFIC OCEAN.

CHAPTER I.

THE RIO GRANDE VALLEY . . . . . PAGE 1

CHAPTER II.

THE MIEMBRES MOUNTAINS AND THE RIO MIEMBRES 17

CHAPTER III.

THE BURRO MOUNTAINS, THE MADRE PLATEAU, FORT BOWIE, AND WHAT HAPPENED THERE 30

CHAPTER IV.

FROM APACHE PASS TO THE ARAVAYPA CAÑON 50

CHAPTER V.

THE ARAVAYPA CAÑON 63

CHAPTER VI.

THE GILA VALLEY AND SOUTHERN CALIFORNIA 78

CHAPTER VII.

SONORA 90

CHAPTER VIII.

PAGE

HERMOSILLO 122

CHAPTER IX.

THE GULF OF CALIFORNIA 133

CHAPTER X.

NATURAL RESOURCES OF SONORA 143

CHAPTER XI.

HOW THE SURVEYORS FARED ON THE 35TH PARALLEL 164

CHAPTER XII.

CENTRAL ARIZONA 185

CHAPTER XIII.

PASSAGE OF THE GREAT CAÑON OF THE COLORADO BY JAMES WHITE, THE PROSPECTOR 199

CHAPTER XIV.

RETURN JOURNEY *viâ* SALT LAKE 218

PART IV.

THE PACIFIC RAILWAYS.

CHAPTER I.

HISTORY OF THE PROJECT 237

CHAPTER II.

THE OMAHA LINE 248

CHAPTER III.

THE KANSAS PACIFIC RAILWAY 258

CHAPTER IV.

PAGE
THE NORTHERN PACIFIC RAILWAY 263

CHAPTER V.

FUTURE PROSPECTS 268

CHAPTER VI.

EMIGRATION 275

APPENDICES.

APPENDIX A.

Botanical Report, by C. C. Parry, M.D. 285
List of Plants collected on the Survey 292

APPENDIX B.

Routes Examined and Surveyed 303

APPENDIX C.

Photography 320

ILLUSTRATIONS.

LITHOGRAPHS.

		PAGE
The Wahsatch Mountains from Salt Lake City—*Frontispiece.*		
The Rio Grande del Norte, New Mexico	*To face*	14
La Ténaja (Water Basins in the Rock)	,,	18
The City of Rocks, Rio Miembres	,,	26
Apache Pass, from Fort Bowie	,,	46
The Cañada of the Aravaypa	,,	62
The Aravaypa Cañon	,,	72
Babuquivari Peak in the Papago Country	,,	105
The Surveyors at Work	,,	164
El Moro (Inscription Rock)	,,	168
Tehachapa Pass in the Sierra Nevada	,,	192
The Great Cañon of the Colorado	,,	208
A Herd of Buffalo in Western Kansas	,,	233

WOODCUT ILLUSTRATIONS.

The Teams at Eventide, California		*Title page.*
Fort Cummings and Cooke's Peak		20
Ojo Caliente		27
Stean's Pass by Moonlight	*To face*	42
Our First Camping Ground		66
The Cereus Giganteus		71
Mazatlan		141
Hydraulic Mining		196
A Mormon Family		225

Diagrams	*To face*	134
Harbour of San Francisco.		
,, San Diego.		
,, Guaymas.		

PART III.

FROM THE RIO GRANDE DEL NORTE TO THE PACIFIC OCEAN.

FROM THE RIO GRANDE DEL NORTE TO THE PACIFIC OCEAN.

CHAPTER I.

THE RIO GRANDE VALLEY.

Colton and Bell start on a Coal Hunt.—Galisteo.—Revisit the Real de los Dolores.—Tejeras Cañon.—Manzana Mountains.—Albuquerque and the Friends we made there.—Isleta.—The Rio Grande del Norte.—Mexican Ranches.—The Valley, the Plateaux, and the Mountains on either side.—Fort Craig.—Our Surveying Parties reassemble there.—General Wright and Dr. Le Conte leave for the States.—Reorganisation of the Parties under General Palmer.—Open House and open Cellars.—Start afresh, and march seventy miles still further South in the Rio Grande Valley.—Uninhabited for one hundred miles of its length.—La Mesilla Valley.—Last Camp on the Rio Grande, and our Visitors.—This Valley a grand field for Emigration.—Vine Culture.—Two Horses bitten by Rattlesnakes.

Distance, 281 miles.

On the last day of September, after a fortnight's sojourn, Colton and myself, without attendants or luggage, left Santa Fé on an independent search, the object of which was coal. Several spots had been named as coal-bearing districts, and it was necessary to test the truth of these promising reports. Without change of horses, our week's ride was the following :—

			Miles.
1st day	Santa Fé to Galisteo	. . . . .	22
2nd ,,	Carpenter's Ranche (Tejeras Cañon)	. . .	40
3rd ,,	Albuquerque (Rio Grande)	. . . . .	18
4th ,,	Visit to coal-fields, eight miles from Albuquerque	.	16
5th ,,	Belen (on Rio Grande)	. . . . .	32
6th ,,	Limetar ,,	. . . . .	41
7th ,,	Fort Craig ,,	. . . . .	42
	Total for the week	. .	211

In the object of our search we were by no means successful; not, as we afterwards discovered, because there was no coal in those localities which report led us to visit, but because those who knew of it determined to keep it secret, supposing that the railway company would devise some plan of robbing them of the fruits of their discoveries. This was not surprising amongst the suspicious Mexicans, but so "dog-in-the-manger" a policy is not usually a trait in the character of American frontiersmen. At the village of Galisteo we could not find any one willing to show us the coal veins, although they did not deny their existence. We were surprised to see the large herds of horned cattle owned by the Mexicans here. The whole place bristled with the poles of which the coralles were made, and at sunset these enclosures were crowded with stock. Notwithstanding that hundreds of cows were standing around, not a drop of milk could be got for love or money.

On our way to Tejeras Cañon, a fine natural pass lying between the Placer Mountains and the Zandia, we visited for the second time the hospitable dwelling of Dr. Steck at the Real de los Dolores.

When at eventide, after a long and difficult ride over mountains and ravines, through forests of piñon trees, often without trail of any kind, we reached the ranche of Mr. Carpenter half way through the pass, we soon found by the manner of our host that the object of our search was not to be attained. He could show us plenty of gold quartz veins, kaolin, and gypsum; argentiferous galena also was to be found in many places not far from his ranche; and as for copper, any quantity of it cropped out in the cañon; but of coal there was none; this was the only thing he had not got, —we must have been misinformed, which was not his fault. Such was the information we received; so, after a miserable

upper and breakfast of rusty bacon and very stale bread, we mounted our steeds and went our ways.

The coal vein we thus failed to visit is situated south-west of Carpenter's, not in the Tejeras Cañon proper, but in one of the western ravines of the Manzana Mountains, and is about seventeen miles east of the Rio Grande. A surface specimen given to Dr. Le Conte by Colonel Watts at Santa Fé was of excellent quality.

The road through the mountains down to the plain of the Rio Grande valley is very wild and romantic. The rock exposures are bold and imposing, towering up to the sky, and presenting great varieties of colour and outline; for some are composed of masses of granite; some of sandstone, grey and red; others are of smooth, shining, metamorphic rocks; and again, others consist of marbles beautifully variegated, white, pink, and grey, the fractures remaining bright and sparkling for a very long time in the dry atmosphere of these regions. When in the afternoon we had left the mountains many miles to the east of us, on our way to Albuquerque, and looked back at their sharply-cut sides, perfectly bare, precipitous, and jagged, brilliantly lighted up by the declining sun, the sight was very remarkable, and one long to be remembered. Not a tree is to be seen on the steep western slopes of the mountains, and if there be grass or other vegetation here and there amongst the crevices, it is not noticeable at a distance; everywhere huge masses of variegated rock rise for thousands of feet above the plain, and throw their ever-varying shadows deep and crisp upon each other.

Albuquerque, the second town in rank to Santa Fé, does not present an imposing appearance. It is a straggling collection of adobe houses, scattered amongst innumerable acequias or irrigating ditches, in the perfectly flat lowlands

of the Rio Grande valley. In a direct line it is sixty-three miles from Santa Fé. A few groves and solitary cotton-wood trees give a degree of shade to the place, but beyond this it might be a brick-yard as seen at a distance. Distance here certainly does not lend enchantment to the view, for on close inspection every house is found to possess a garden well filled with peaches, apples, plums of every description, and vines bearing most delicious grapes. Then, as one approaches, fields of Indian corn pop up on all sides, having been hidden from view by the lowness of their position; and, lastly, in the centre of the town, a very inviting church, with twin spires, adds greatly to the appearance of the plaza.

The little American colony here received us most hospitably. In the evening all sat together, a party of nearly a dozen, in the large cool room of one of the resident merchants, and enjoyed a social chat whilst full justice was done to the flowing bowl.

Money-making is, of course, the great desideratum which attracts the white man to so out-of-the-way a country, far from home, and often also from all that is dear to him. Once here, he cares little what he does provided it pays. The most entertaining man of the evening at Albuquerque was a young Southerner, who kept us in roars of laughter with his droll stories, while he did the honours of the evening with the most delightful ease and good breeding. At parting, he told us that we should be called early next morning to visit some of the fruit gardens and take an early breakfast—breakfast No. 1—of grapes and peaches. "You must come and see me on your way," said he; "I am the butcher of Albuquerque, and as the people must have their chops, you must excuse my absence." So next morning, as we were being conducted to the vineyards, we recognised our friend—

with blue blouse and paper cap—knife in hand, performing wonders in dissection upon his slaughtered sheep. Two hours later, on our return to the hotel, we stopped at the office of the *Albuquerque Chronicle*. At the door we met the editor and proprietor, who, to our great amusement, was no other than our facetious host of the night before, the butcher of Albuquerque, and now, bereft of blouse, the energetic editor of the daily paper.

Is not a lesson to be learned from this little sketch of Western life? I would at least respectfully recommend it to the consideration of our would-be emigrants.

From Albuquerque we travelled in the valley of the Rio Grande, 115 miles, to Fort Craig. For the whole of this distance the valley was studded on both sides with numerous villages, some belonging to Pueblo Indians, the greater number to Mexicans. The largest of the former was Isleta, where Colton and myself rested an hour or two at mid-day, after leaving Albuquerque, and enjoyed the produce of a very fine vineyard, cultivated, of course, by the Indians. The houses were built, like those of the Mexicans, of adobe, but were much larger; many were of two stories; all seemed to contain more than one family, and were not entered from the outside or from the roof, as it is common in some pueblos, but generally from an inner court. The irrigating ditches were well built and cared for, and the whole place had a more well-to-do look about it than the Mexican villages generally exhibit. The crops were also finer. Some of the Indians, clothed in buckskin and in fur, lay basking in the sun, and took little or no notice of us as we passed.

The greater part of the valley is here almost entirely destitute of trees. This may be partly accounted for by the fact that the banks of the river are of a sandy, friable nature,

and that the bed of the stream is always changing its position, sometimes to one side, sometimes to the other; thus destroying fields of corn, irrigating canals, and villages; taking from one man and giving to another, covering rich tracts of alluvial soil with sand and rubbish, and undermining the trees which had arrived at maturity on the firm dry land. About latitude 32° 13′ are two flourishing towns, La Mesilla and Los Cruces. Not long ago the river passed between them, but now they both lie on the left bank, the stream having completely changed its channel without disturbing either.

Between the villages we often met with ruins of towns, now quite deserted, but once far more extensive than those still inhabited. These ruins were generally of adobe; but some of the most extensive had stone foundations, and were therefore, without doubt, of Aztec origin.

Our daily wants obliged us often to visit the cottage of a Mexican for lodging or refreshment; and although the latter was usually scanty enough, the former was the perfection of rustic neatness. Household cleanliness is as natural to some nations as "pigstyosity" is to others. Compare the Irish peasantry and the Mexican peons. Both are Roman Catholics; neither, as a rule, are well fed or well clothed; both are indolent by nature; and, as far as brains go, surely the Irishman stands foremost. Yet enter their cottages. In one case you instinctively hold your nose, and back out. In the other you sit on the floor with pleasure, and use it as a table without the least compunction. Although great neatness is the rule wherever I have travelled amongst the Mexicans, the cottages along the Rio Grande, especially towards the south, seemed to be kept with special taste. When shown into the parlour, we would look with dismay at our dusty boots and soiled apparel, for the floor would be often com-

pletely covered with snow-white lamb-furs; the ottomans, or rather the folding mattresses surrounding the room, would be cased in beautifully-washed white cotton counterpanes, or Mexican blankets striped with different colours, but equally pure and spotless as the counterpanes. They have also a neat way of covering the ceilings with canes similar to bamboo-canes, which are arranged in patterns very much like those we often see lining the walls of an English summer-house. Although a frizzled-up mutton-bone, or some sun-dried meat swimming in fat, with tortillas (unfermented bread) about as thin, tough, and tasteless as buckskin leather, are generally all you can confidently look forward to, still you may feel quite certain that your host has done his best. The people are most courteous to their guests; but they seem quite ignorant of the existence of butter, bread, or vege-tables of any kind, except in a few of the larger towns. Chili Colorado (red pepper) beans, Indian corn, and mutton (mostly sun-dried) pretty well complete the list of their necessaries of life—not forgetting, of course, tobacco, and water-melons when in season.

On the afternoon of October 6th, after an unusually long stretch (thirty miles) of uninhabited valley, we came in view of the flag which waved over Fort Craig,—a military post, placed on the top of some barren, sandy bluffs overlooking the stream. Between Albuquerque and this point (115 miles), the valley varies in width from five or six miles to a few hundred yards. When I say "the valley," I mean the level central trough between the bluffs or cliffs on either side. It is very seldom, in this distance, that these bluffs approach so close as to hem in the stream and obliterate the valley; and when they do it is only for a very short distance. Isleta is one of these points; San Felipe another; Fort Craig a third.

But, usually, there is a large tract of irrigable land on each side, capable of sustaining a very considerable population.

On ascending the bluffs on either side, you come upon a level grass-covered plain, which slopes up gradually towards the mountains beyond, and usually contains no water whatever. On the eastern side the mountains consist of detached ranges—the Zandia, Manzana, Sierra de Coboleta, and Sierra del Oso. One of these ranges is always within view from the river, but none approach very close to the lower valley. Below Fort Craig, however, the eastern ranges encroach so much on the river as to obliterate the grass-covered plateau, and reduce the bottom-land in many places to an insignificant strip.

On the western side the plateau beyond the bluffs usually slopes back much farther before reaching the mountains, which are far more formidable than those on the eastern side of the valley. These are the Zuñi Mountains, which traverse obliquely 2° of longitude, from Campbell's Pass to the Rio Grande, near Fort Craig, where they seem to be continued on the other side by a range of mountains—the Sierra del Caballo—which hugs the eastern bank. It was thought very naturally by General Wright, that having turned the lower end of this range in the neighbourhood of Fort Craig, we might be able to pass westward, and strike the Rio Gila without going further south; but behind the Zuñi range rises another quite as formidable. Nor was there to be found any break in it which would give the least chance of success for railway purposes until after it had joined the mass of mountains known as the Miembres Mountains, south of latitude 33°. As these formidable barriers form the divide between the waters of the Colorado Chiquito and the Gila on one side (emptying into the Pacific), and those of the Rio

Grande on the Atlantic slope, they have received by the Spaniards the collective name of Sierra Madre, which name must not cause them to be confounded with the Sierra Madre 3° south of them in Mexico proper. This fact is certain, that no railway can ever be constructed across this great western barrier between Campbell's Pass and the Miembres Mountains; and even if it were possible to cross the main divide between these points, and to strike the Rio Gila in New Mexican territory, it would be perfectly impossible to follow that stream through its mountain gorges.

We found all our parties congregated at Fort Craig, for it had been made the general rendezvous previous to reorganisation and a fresh advance westward. Mr. Imbrey Millar, having taken his men safely through the Sangre de Christo Pass, and surveyed a line over that lofty region to the headwaters of the Rio Grande, had rapidly marched with them straight down the valley 380 miles. Mr. Eicholtz and his party had surveyed a good line through the Abo Pass; and Mr. Runk, under the immediate superintendence of General Wright, had continued the main line of survey down the Rio Grande valley from Isleta to Fort Craig.

Having thus far completed the object of the expedition, General Wright's labours in the field came to an end; and here he left us, in company with our geologist, Dr. Le Conte, the one to make up his reports and lay them before the expectant directors, the other to visit the coal-fields near Denver.

Here we found Palmer straining every nerve to hasten as quickly as possible the fresh start. For some time it had been undecided whether the route along the 35th parallel would warrant a separate examination or not; for Jeffer-

son Davis, when Secretary of War, after several elaborate Government surveys had been made, gave the route along the 32nd parallel the decided preference. Palmer, however, after collecting all the information possible throughout the country—after holding consultations with the most experienced guides and prospectors who could by any means be summoned to meet him at Santa Fé and elsewhere—after consulting with the commanders of forts, Indian scouts, Mexican shepherds, and examining every source of information connected with the almost unknown regions to the westward—came gradually to the opposite opinion, and determined that the route along the 35th parallel should be most thoroughly explored. He sent back to Kansas for two more surveying parties under Colonel Greenwood to meet him at Albuquerque, and applied to Government for additional transportation and another escort of sixty cavalry for their protection.

Two parties were intrusted with the examination and survey of the 32nd parallel route. One, under Mr. Runk, was to continue the main line down the Rio Grande so as to strike the passage westward through the Miembres Mountains, known as Cooke's Cañon, which opens upon the vast plain, the Madre Plateau. To Mr. Eicholtz and his party were intrusted the "cut offs," that is, the examination of doubtful passes, which, if practicable, would shorten and improve the line run by Mr. Runk across country which was already known and considered practicable. General Palmer himself, with the third party, viz., that under the command of Mr. Imbrey Millar, was to retrace his steps to Albuquerque, and then, being reinforced by the two fresh parties brought by Colonel Greenwood, was to explore the route along the 35th parallel. Three parties, therefore, were

organised to survey the northern route, and two the southern. I took the latter route.

Before bidding adieu to Fort Craig, I must here acknowledge the great hospitality of Mr. Wardwell, the sutler at whose house General Palmer, Colonel Willis, Captain Colton, and myself remained as guests during our stay there. The good old mediæval custom of keeping open house has very nearly passed away, even from those spots where for ages it was the pride of the proud lords of the soil; but the still more bounteous "institution" of keeping open cellars is not unfrequently met with in the Far West, and nowhere on such a scale as at our host's in Fort Craig. All day long, and often far into the night, did the doors of these capacious vaults remain open. Rows of glasses stood temptingly at the entrance; and below, in dim twilight, might be seen rows of casks, from all of which stuck out the unlocked tap. The barrels were not of beer, but Borbon whiskey and other spirits, El Paso wine, and real Cognac. All who had the slightest claims to acquaintanceship with the host, which in this land of freedom meant "a pretty big crowd," were at liberty to help themselves whenever they felt inclined, and seldom indeed did I approach that seductive cave without hearing the suggestive pop of the champagne cork.

On Tuesday afternoon we started afresh on our journey. I joined Mr. Eicholtz's party. During the week we marched seventy miles due south, to a point on the Rio Grande sixteen miles north of Fort Thorn, where we left the valley by a gentle ascent, and proceeded westward. So much had this portion of the valley been ravaged by the wild Indians—the Apaches and Navajos on one side, and the Comanches on the other—that it was completely depopulated. Travelling down the western side, we passed through the

October 8.

ruins of a large village, formerly known as the Alamosa, about half way between Craig and Thorn. The inhabitants, having abandoned their homes and the rich lands around them, had built another village on the opposite bank, under the protection of a small post, Fort M'Rae, garrisoned by a few United States troops. New Alamosa, as it is called, is the only village we saw on the opposite bank for seventy miles; and on our side, Polomas, a place of some twenty houses, alone remained inhabited. For twenty miles further down the river than we went the valley is abandoned to the lizard and the rattlesnake. Then comes a section where the Mexican population has been strong enough to hold its own, and has been able to plant vineyards and orange-groves, and to gather in their fruits in due season. The district is called the Mesilla valley, and is spoken of with pride by the people of the country as the "Garden of the Rio Grande."

While resting during Sunday at our last camp on the Rio Grande in a large valley, some twenty miles long by six broad, a party of Mexicans and Americans came from Mesilla to meet General Palmer and to give us welcome. The General, of course, was not with us, but we drank his health in fragrant El Paso, grown in the Mesilla valley, and brought to us by our new friends. We were surprised to come across this little party in so lonely and deserted a place. I had much talk with them on the subject of the valley I had just descended for so many hundred miles. They compared the part we were then encamped in with the Mesilla valley, and said that *naturally* it was finer in every respect, but being uninhabited and unirrigated, it was to the eye little better than a parched desert filled with mezquit bushes and brushwood. The opinion expressed by these men, the information I had gleaned from every source, and my own

conviction drawn from close observation, have convinced me that there is no more splendid field now open for emigrants than this long-deserted valley of the Rio Grande del Norte, for the stream itself is not shut up in a gorge or cañon for a single mile through 4° of its course in New Mexico, although only a few miles south of the Mexican boundary-line it becomes almost buried in the earth for 160 miles, so continuously is it enclosed in lofty cañons.

I would especially recommend this fine valley to the consideration of German emigrants who are acquainted with the cultivation of the vine, for no production is so much in demand and commands so high a price throughout the States as drinkable wine of any sort. Champagne, made in Missouri and Ohio, costs from two to four dollars a bottle, and the few good still wines made at Cincinnati bring exorbitant sums. The same may be said of Californian wines; but most of these are of inferior quality, and require doctoring to make them keep. Not so the juice of the Rio Grande grape. Originally, most of the species grown here came from Spain; the fruit is, if anything, too sweet to the taste, and very full-flavoured; but as the amount of alcohol depends chiefly upon the amount of sugar, the wines made from it are very full-bodied, and, judging from the El Paso wine, which alone has received any attention whatever, are likely to develop very high-class qualities when matured by age. As each soil produces its distinct varieties of wine, almost regardless of the original species of grape, it is hard to give an idea of any particular wine by giving it a well-known name. Dr. Le Conte compares the wines now made in small quantities on the Rio Grande to middle grades of Sauterne; but they do not possess the mawkish sweet flavour peculiar to Sauternes, and have a great deal more body. Were I to name Madeira, I

should be equally far from the mark; yet there are qualities about El Paso wine which remind you strongly of those very different wines, and make you fancy you might be drinking them mixed.

The length of the valley from Algodones to El Paso is rather more than 200 miles; the average width is, say, five miles, and if but 40 per cent. of this area is devoted to grape culture, we immediately obtain 400 square miles, or 265,000 acres. Taking the yearly production of wine as low as seven barrels per acre, we have 1,792,000 barrels, or 57,344,000 gallons.

At the lowest computation this wine would fetch one dollar a gallon in the States, so that if we suppose 50,000,000 gallons to be about the proportion transported, and 40 cents per gallon to be paid in freight by rail to St. Louis, we have a yearly revenue to the railway company (in the far distance, no doubt) of 20,000,000 dollars,—a sum sufficient to pay over 12 per cent. on the entire capital,—and 30,000,000 dollars to the grape growers of the Rio Grande valley. But little attention is given to the vine plant either by the Mexicans or Pueblo Indians; they do not even stake it up, but allow the grapes to lie in the dust; but this I noticed everywhere, that the plants were kept well pruned, and not allowed to grow more than 2 or 3 feet from the roots. Irrigation to some extent was always employed; but I think it probable that where any large extent of bottom-land is irrigated for Indian corn or other succulent vegetation, vines will be found to thrive well on the higher lands all around, for they require but little water, and often produce the best qualities of wine on the driest soil.

The accompanying engraving is an exact copy of a photograph I took just before leaving the valley from our camp at

Vincent Brooks, Day & Son. lith

THE RIO GRANDE DEL NORTE, NEW MEXICO

early morn. An abundance of very large cotton-wood timber is seen in the background. Such views as these are met with everywhere throughout the hundred miles of uninhabited valley; but, thirty miles north of Fort Craig, timber begins to diminish, and the higher you go amongst the settlements the scarcer, unfortunately, it becomes. Twenty years, however, would make the bare parts of the valley quite as beautiful as the uninhabited districts further south, were cotton-wood trees planted along the acequias.

During the last day's march along the Rio Grande two of our horses were bitten by a rattlesnake, the same one having, it is supposed, bitten both in the under lip as they were feeding together in some long grass. I did not see them until a few hours afterwards, and they were then in the most pitiable condition. The submaxillary, parotid, and all glands situated about the head and down the neck became greatly enlarged, disfiguring the poor animals dreadfully. From their nostrils and swollen gums a clear mucous discharge ran down. Their eyes were glairy, pupils greatly dilated, coats rough and staring; they would not look at their corn, and were so submissive that you could do anything with them you liked. They were at the time in the best condition, but one of them had evidently received a much stronger dose of the poison than the other. I gave each of them half a pint of whiskey with a little water, and half an ounce of ammonia. I kept the wounds fomented with a strong infusion of tobacco, and poulticed them with the chopped leaves of the same. I expected that one horse would certainly have died, but both recovered. One, although reduced in flesh and thrown out of condition, was fit for work in a week; but the other only just escaped with his life. He became a perfect skeleton, and would have been abandoned had I not wished to see the

ultimate results. At the end of three months he also began to pick up, and eventually recovered without any abscesses or sloughs having taken place. I saw one horse, which had been bitten in the leg, literally covered with sloughy gangrenous ulcers; these healed, however, and he ultimately recovered.

There is a little weed common throughout the Western country called by Engelmann *Euphorbia lata*, by Torrey *Euphorbia dilatata*, which is said to be a specific for the bite of the rattlesnake. A doctor, whose name I forget, has published an account of his experiments with this plant; he gave a strong infusion of it to a dozen dogs which were in different stages of collapse from snake bites; all recovered but one, and he could not swallow the drug. At the very time when I wanted this plant I could not find it, although I met with it everywhere along our route.

CHAPTER II.

THE MIEMBRES MOUNTAINS AND THE RIO MIEMBRES.

Leave the Rio Grande Valley.—"La Tenaja," or the Water-bowl.—Mule Spring.—Search for Palmer's Pass.—Survey the Pass.—Cooke's Cañon.—The Discovery of Copper in the Miembres Mountains by the early Spanish Explorers.—Subsequent History of the District.—Discovery of rich Gold Deposits.—Success of the Miners until the Indians drove them away.—Work resumed again four years later, but abandoned on account of the Indians.—The Pinos Altos Mines.—Mangas Coloradas.—The Days of Indian Wars are numbered.—The Rio Miembres.—The City of Rocks.—Ojo Caliente.—Colton arrives from Mesilla with Guides.—"Jornadas."

Distance, from Rio Grande to Ojo Caliente, *viâ* Palmer's Pass, fifty miles.

The mountains to the west of our course having gradually merged into rough undulating country formed of bluffs whose ridges run at right angles to the river, we bade good-bye to the Rio Grande, and commenced to survey and explore the first "cut off" by following up one of the ravines to the westward—the Cañada de St. Barbara—towards the Miembres Mountains. Nine miles brought us to a water-hole, called "La Tenaja" by the Mexicans, where three basins, one above the other, were scooped out in a large mass of rock, which here blocks up the channel of the gorge. There is, without doubt, a beautiful cascade here at times; but then (Oct. 14th) the bed of the stream was quite dry, although one of the natural basins was nearly full of good soft water. It was, however, quite inaccessible to the stock, which could only approach the lowest bowl with difficulty. The water had therefore to be poured in bucketfuls from the middle basin down to that below.

Another march of ten miles brought us to the foot of the mountains, and we camped at a spot called Mule Spring, where we found a good supply of water by digging.

The most southern spur of the Miembres Mountains, called, from its highest summit, Cooke's Peak Range, is about twenty-five miles long. Seven miles from its termination it is cut through by Cooke's Cañon; but Palmer had heard at Santa Fé that another pass existed more to the north, that a train of wagons had once passed through it, and that it was practicable for a railroad. We now set to work to find this pass. Our guide, Juan Arrolles, had never even heard of it. Nothing daunted, we started at daybreak next morning, a little party of six, up into the mountains. By twelve o'clock we were resting our panting horses and surveying the peaks all around us from a grass-covered eminence. Looking westward, we saw, a few miles distant, a deep break in the mountains, and a cañon, or narrow arrayo, leading to it. This we followed. Every mile it became better and smoother, and opened straight upon the plain without any precipitous descent. Our delight was great; so we determined to turn back, and trace the cañon, if possible, across the medium line of the mountains, and see if it opened upon the eastern plain from which we had come. After riding all day, we came in view of the eastern plain, just as sufficient light remained to see it, and to prove that our labour had not been in vain. We were still far from camp; mountains were all around us; the sun had set; there was no moon; and darkness soon covered everything. We could not so much as see the face of our compass, and had to keep in the closest single file, for fear of losing each other.

It was in such a predicament as this that the wonderful faculty of locality which is peculiar to the semi-civilised man shone out so conspicuously. Not one of us could tell even the direction of camp; yet the Mexican guide brought us straight to it, after a three hours' ride, over country he had never traversed before, and this, too, in pitch darkness. It was nevertheless a rough ride, for, regardless of obstacles, we went

Vincent Brooks Day & Son lith

LA TERRAJA (WATER BASINS IN THE ROCK)

straight over everything, walking, climbing, and riding in turns, until the sight of our watch-fires gladdened our hearts. Our poor horses were quite worn out, for they had travelled at least fifty miles over the pathless mountains.

Next day we continued the survey. Seven miles brought us to the entrance of Palmer's Pass, the name given to it by us. Eight miles more took us to the summit, and a little more than two miles further on we came out upon the plain beyond. The summit is 5,654 feet above tide, 717 above the entrance to the pass, and the average grade is less than 100 feet per mile on the surface, which could be lessened to about 75 feet on construction. By digging we found water at three places in the pass, at two of which we passed a night. No sign of wagon-wheels could anywhere be detected; and an Indian trail which led through it was quite overgrown and almost obliterated. The pasturage was splendid, and there was no scarcity of wood. While the surveyors were running their line through Palmer's Pass, I went with some wagons for supplies to Fort Cummings, and visited Cooke's Cañon, which pass the fort protects. Hundreds of miles before we reached it, I listened with anxiety to the stories told me by the frontier men about the dreadful massacres perpetrated by the Indians in that dread gorge. It was said that even the soldiers dared not stir a mile from the post, and that it was "just a toss up" whether any traveller got through alive. These reports were only the surviving echoes of events which have made Cooke's Cañon and the Miembres Mountains memorable in the annals of New Mexican massacres.

More than a century and a half ago, the Spaniards, as they passed northward in search of gold, discovered in these mountains vast deposits of copper ore, much of which was virgin copper, so pure that it could be hammered out into plates as it came from the mine. At this place, known as the Santa

Rita Copper Mines,* they carried on mining for many years, and, as the ruins of a large prison bear testimony, obliged the natives by main force to work the mines as their slaves. As in other places, so it happened here, the white men were swept from the soil, and all mining ceased. When the gold mines in California were discovered, and parties of emigrants commenced to cross the continent on their way thither, many chose the southern route by the 32nd parallel; and after

Fort Cummings and Cooke's Peak.

Cooke had made two successful trips, had explored the pass which now bears his name, and had shown that water could be obtained at certain places all the way to California, this route gained favour. Cooke's emigrant road, however, is dreadfully roundabout; and the sufferings of the emigrants,

* The Santa Rita Copper Mines are forty-one miles from Fort Cummings, *viâ* Ojo Caliente and Fort Bayard, ninety-five from Fort Craig direct, and 110 miles from Mesilla.

rom want of water and the loss of their stock, might well orm a subject for one of Mayne Reid's novels. This passing o and fro of a mining population naturally led to the re-pening of the Santa Rita mines, situated as they are close o the line of travel. Much valuable machinery was put up ere at an immense expense, together with the most im-roved method for obtaining the blast. All around the eighbouring mountain sides other rich discoveries were nade. In 1861, the Hanover Mines, six miles to the north, were discovered, and furnaces were there erected. The ore occurs ramifying through decomposing felspar, sometimes from 50 to 60 feet thick, and gave on analysis 72·64 of oxide, or 58 per cent. of metallic copper. A little to the south-west, the San José mines were also discovered, and, in the same year, the gold mines of Pinos Altos. The region in which all these mines lie is more than 6,000 feet above the sea level. I will give the discovery of the latter place, and the desolation which followed, in the words of General Carlton, who visited it before we arrived in the dis-rict.

"In May, 1860, a Colonel Snively and a party of Cali-ornian miners came to this region, and discovered gold near the present site of the town of Pinos Altos, in what is known as Rich Gulch. In June of that year people commenced coming to work in 'placers.' In December, 1860, there were, say, 1,500 here from Chihuahua, Sonora, Texas, and rom California. They at the same time 'averaged to the hand' some ten or fifteen dollars per day. Other gulches were discovered during the fall and summer of 1860. In December, 1860, the first quartz mine was discovered by Mr. Thomas Mastin with a party of prospectors. This vein is called the Pacific; it runs through the hill, or mountain

rather, which constitutes the divide of the continent, and has been worked on each slope of that mountain.

"In the spring of 1861 this mine was bought by Mr. Virgil Mastin, a brother of the discoverer, and it was successfully worked during the rest of the year. During 1861 the Apache Indians made formidable raids on the stock of the miners, and nearly stripped them of the means to prosecute their labours. A severe battle was fought between the miners and a band of this tribe, under Mangas Coloradas and Cachees. The Indians numbered about five hundred warriors, and came directly into the town now known as Pinos Altos, which the miners had established at a point central to the scene of their labours. This was on the 27th of September, 1861. Thomas Mastin, who commanded a company of volunteers, was killed in this fight. The Indians were driven off, but the impression they had made on the minds of the inhabitants of the town was so great as to frighten most of the latter away. The breaking out also of the rebellion had the effect of inducing many to leave. A few only held on, and amongst them was Mr. Virgil Mastin, who foresaw the future development of the great wealth of this region.

"Not much was done in discovering or in testing the merits of new veins from 1861 to 1864, when still another attempt was made to work the Pacific Mine, and a few other mines which Mr. Virgil Mastin had in the meantime discovered. These latter lodes are known as the Atlantic, Adriatic, and Bear Creek. The work commenced on these was prosecuted but a short time, when the Apaches again came and stripped the miners of their stock. This caused another suspension of labour until 1866, when Mr. Virgil Mastin and others organised a company under the name of

'The Pinos Altos Mining Company,' under charter granted by the Legislature of New Mexico. This company has three lodes, viz., the Pacific, Atlantic, and Bear Creek, and it now has a steam mill in the town of Pinos Altos (June, 1867) which drives three batteries of five stamps each. When all three batteries are kept at work night and day, they crush twenty tons of ore in twenty-four hours. The average yield of ore extracted from the Pacific Mine is from eighty to one hundred and fifty dollars per ton. Ore can be selected from the lode, which will yield one thousand dollars per ton. There are now within a radius of six miles from the centre of the town of Pinos Altos over six hundred lodes of gold and silver, as I have been informed by good authority.

"The population in October, 1866, at the time of renewing operations by the Pinos Altos Mining Company, did not exceed sixty miners. They now numbered from eight hundred to one thousand, and have erected, and are now building, some very comfortable dwelling-houses, and some very commodious stores at Pinos Altos. It is my opinion that before six years shall have passed away there will be a town at or near this place larger than Denver, for it may be doubted if there is on the known surface of the earth an equal number of square miles on which may be found so many rich and extensive veins, both of the useful and the precious metals, as at and near Pinos Altos, New Mexico."*

The history of the Pinos Altos miners is the history of all the others in the neighbourhood. In 1862 an act of treachery was committed by the troops which brought the

* "New Mexico" (a pamphlet), by Charles P. Clever, Delegate from New Mexico, 1868.

Indian hostilities to a climax. Mangas Coloradas, who was the greatest chief in the whole country, was induced to enter a military post, now abolished—Fort M'Lane, twenty miles west of the Rio Miembres—on the plea of making a treaty and receiving presents. The soldiers, however, imprisoned him in a hut, and the sentry shot him at night, on the excuse that he feared he would escape. This act roused the whole Apache tribe to vengeance. The Miembres Apaches, the especial band of the massacred chief, spread themselves far and near all over the country, and every white man they could find was doomed to fall by their silent arrows.

Cooke's Cañon, then traversed almost daily, was one of their favourite spots, and it is said that as many as four hundred emigrants, soldiers and Mexicans, have lost their lives in that short four-mile gorge. I have conversed with a settler who has counted nine skeletons while passing through the cañon, and the graves and heaps of stones which now fringe the road will long bear record of those dreadful times. The breaking out of the civil war caused the withdrawal of many troops who garrisoned the collections of mud huts dignified by the name of forts, which were scattered up and down the country; so that the miners were left at the mercy of the red men; travel was completely stopped; the bright spark of enterprise which had just burst into flame was, for the second time since the discovery of the country, actually snuffed out; the mines and machinery were abandoned; the villages left in ruins; and thus the land relapsed once more into its original solitude.

Again the wave is turning in favour of the white man and settlement. Fort Cummings, a charming little fort enclosed in a square palisade, now protects Cooke's Cañon. Fort Bayard, situated almost equidistant between Pinos Altos, Santa Rita,

and the Hanover Mines, is well garrisoned, and many other posts have been either reopened or newly established. The Apaches have learnt in most places that resistance is hopeless; and while constant warfare ever tends to lessen their numbers, they cease to increase in anything like the same proportion; game becomes scarcer and scarcer; and as they do not cultivate the soil, they now confine themselves to "running off" stock, and to murdering any white man who, unprepared or alone, may fall into their power.

Having surveyed Palmer's Pass, the whole party moved forward across the plain drained by the Rio Miembres, towards the next great obstacle which barred our westward progress—the Burro Mountains. As the general direction of Palmer's Pass is not west, but very nearly north-west, we came upon the plain on the western side of the mountains, some sixteen miles north of the western end of Cooke's Cañon.

After three and a half miles travel, a cañada, or little valley covered with dry grass, took us, in four and a half miles more, straight down to the banks of the river, the descent in the nine miles being 573 feet. This bright and sparkling stream, filled with trout and beautifully shaded with cotton-woods and sycamore trees, appeared to our eyes perfection, for clear liquid water rippling over a pebble bed is a very rare sight in these regions. Yet, as I rode through the little stream, about up to my horse's knees, and disturbed the wild ducks and widgeon which were here very abundant, I could not help smiling as I thought of the bubble company by which some "smart" Western speculators had made this spot memorable. These men thought they would found a city here. They bought the land—I do not know whether they ever saw it or not—and forthwith issued

circulars soliciting investments in town lots upon this magnificent site. Drawings were made of the noble city, in which might be seen, besides the endless rows of lofty buildings, shady avenues, and the broad majestic river, *docks*, and a *steamboat*. These last items were unfortunate, for, in the first place, the Great Rio Miembres has got a very capricious habit of disappearing and reappearing, one might say at pleasure; and in the second, even if it were to flow uninterruptedly for many miles below the "city," it would only be found to empty itself in a small lake, the Laguna de Guzman in Chihuahua, which has no communication with the sea.

Six miles below our camp on the stream is a little Mexican settlement of some three hundred people. This had been abandoned for years on account of the Indians, but in 1865 it was again reinhabited. It is the only "city" as yet to be found on the Rio Miembres. Much fine bottom-land skirts the stream from the village to its source, hardly any of which is cultivated. Many curious natural ruins are to be found near the western bank. There are the valley of rocks, the city of rocks, &c., in which huge masses of sandstone form pillars, chimneys, altars, giant mushrooms, and temples which would compare not unfavourably with Stonehenge, had they not been geological curiosities only. I enjoyed a few hours' photographing amongst these grotesque forms, for they made splendid subjects for the camera.

Six miles beyond the river is a fine hot spring, Ojo Caliente, the second met with on our route. It issues from a mound which rises some 50 feet above the level plain; it is some 12 feet deep, and about the same in diameter, and looks very like the crater of an extinct volcano, although the mound may have been formed by the incrustations of lime

Vincent Brooks Day & Son Lith

THE CITY OF ROCKS, RIO MIEMBRES.

leposited for ages from the water. Carbonic acid gas bubbles ıp continually from the bottom, and the more the bubbles the ıotter the water becomes. The temperature, when I visited t, was 127° Fahr. Nitrate of silver produced no precipitate; evaporation, no perceptible residue; and as the water is taste-ess and gives no odour of sulphur, I conclude that it is of ınusual purity, though not medicinal in any way. I kept an egg in the crater all night, but it was still uncooked in the

Ojo Caliente.

norning; the spring is, however, a little too hot for bathing, nd would scald any one unfortunate enough to slip into it. ome future hog-raiser will doubtless find it useful. Three ot and smoking streams trickle down from the mound ırough gaps in its side, one of which is conducted into a ath-house, composed of seven rooms. This hydropathic stablishment belongs to Mr. Virgil Mastin, father of the

chief proprietor in the Pinos Altos Mines. He lives here with his wife and daughter, and has made his house celebrated for its well-filled table and delicious dairy produce. I almost blush with shame when I think of the amount of true animal enjoyment which half-a-dozen "square meals" gave me at Ojo Caliente. My readers, however, who have travelled long in the wilds, and lived month after month on anything that would satisfy the desire for food, will, I am sure, forgive this gluttony.

The garden, irrigated from the hot spring, supplied the table with fresh vegetables, amongst which tomatoes and the delicate Gumbo pod (for our hosts were Southerners, and had brought it from the land of cotton) were most worthy of notice. The butter was faultless, and told as much for the richness of its pasturage as for the skill of the fair daughter of our host. A housekeeper, either in London or New York, would decidedly object to the price—two dollars a pound. The *neighbours* at Fort Cummings (thirty miles) and at Mesilla (seventy-five miles) were, however, very willing to give it. Mr. Mastin is waiting patiently for the development of the country, when he feels no doubt that he will become a rich man. He has several springs on his property, besides Ojo Caliente, around which he can irrigate a good deal of very productive soil. The grazing is unlimited, and, curious to relate, the Indians have not as yet "run off" any of his stock.

Colton here rejoined our party, and found in my tent a hearty welcome and a vacant space. He had gone from Fort Craig down to La Mesilla to procure guides, during which trip he traversed the "Jornada del Muerto," or journey of death, as the road across the arid plain which lies at the back of the Sierra del Caballo is called by the Mexicans. In a distance of eighty miles permanent water is only once

found. Jornadas, or long stretches of country without water, form the greatest difficulty, next to the Indians, which beset the path of the traveller and emigrant, and they become more and more frequent until California is reached. Year after year, however, these jornadas are cut down in length by the discovery of springs or better-watered routes, or by digging out and enlarging transient water-holes, so that a sufficient supply can be retained in them, after the rains, to last during the intervening droughts.

Two guides had been engaged by Colton; both were Americans—one for each party. We could not hope for a better one than Juan Arrolles, who was still with us; but Colton having heard that a prospector, named Simpson, had passed through the largest and most difficult gorge on our proposed line of survey—the Aravaypa Cañon—thought himself fortunate in being able to engage him, for very few had ever entered that defile. It was *considered* as dangerous as it was *known* to be difficult, and even the most experienced of Western travellers laughed at the idea of our attempting to force our way through it, or survey it for a railroad.

CHAPTER III.

THE BURRO MOUNTAINS, THE MADRE PLATEAU, FORT BOWIE, AND WHAT HAPPENED THERE.

Hot Spring (Lemon Spring).—Large Cactus Groves abounding in Game.—No Water.—We discover Water at the foot of the Burro Mountains.—Deceptive appearance of this Range when seen from a distance.—Grand View from the Summit.—Examination of a Pass through the Range.—It proves unfit for a Railroad.—Abandon the Line.—Soldier's Farewell.—The Madre Plateau.—Barney Station.—The Water-hole and those who drink at it.—The Mirage.—Fresh Arrivals.—Mr. Runk's Party.—Result of Survey from Fort Craig to Barney Station.—Stean's Pass (Peloncello Range).—A Moonlight March.—Fifty-seven Miles without Water.—Cienega de San Simon.—How the Mails are carried through a Hostile Indian Country.—The Chiricahui Mountains.—Cachees and his Warriors.—Apache Pass.—Fort Bowie.—The Surprise.—The Pursuit.—Comrades missing.—The Search.—Another March by Moonlight.—The Graveyard amongst the Mountains.

Distance, 108 miles.

On Friday, October 25th, we left Ojo Caliente, and came, in less than three miles, to a very fine spring, which bubbled up vigorously from the ground in a little basin surrounded by lofty cotton-wood trees. The water, however, was hot, but not so hot as that we had left. Here we camped while a reconnoissance was made in advance to discover water and to direct the course of the survey; for we had followed neither road nor trail since leaving the Rio Grande. In the evening the little party returned, and reported open country ahead, but no water, at least for twenty miles, the distance they had been. It was, however, determined to fill up the water-kegs, eight in number, each holding ten gallons, and to push forward

to some willows and cotton-wood trees about eighteen miles distant, where we hoped by digging to find a spring.

At sunrise next morning (Saturday) we started, traversing a slightly undulating plain, covered, as far as the eye could reach, with the most magnificent pasturage. For five miles, as we followed a dry valley or trough in the plain, our route passed through a continuous grove of cactus plants, averaging from 10 to 20 feet in height. Here and there a yucca plant, or "Spanish bayonet," shot up its lofty stems amongst the cacti, adding very much to the grotesqueness of this curious vegetation. The cactus groves were as thickly stocked with the Gila quail, really a species of grouse, as a moor in Scotland with its feathered game of a similar kind. Enormous coveys of thirty or forty brace rose up on each side as we passed, and ran along in front of our horses.

On reaching the willows, no amount of digging produced a drop of water; so after trying several places, both up and down the dry bed of a stream, we were obliged to put up with a dry camp. The poor horses, as usual in such a plight, looked the picture of misery after their dusty march, and seemed to ask with their eyes, "Why are we forgotten?" We chained up the mules with extra care, and let them kick away to their hearts' content, and make the night hideous with a chorus from their seventy dry throats.

Sunday, throughout the expedition, was generally kept as a day of rest; but this was an anxious one to us, for besides the mules, we had forty horses and five oxen, and scarcely water enough for cooking and drinking purposes. I joined the water-hunters at daybreak, and, armed with spades and picks, as well as our carbines and "six-shooters," we directed our course towards the Burro Mountains, the next obstacle to the westward. We had, in fact, nearly crossed the plain between

Cooke's Range and these mountains, and soon entered a ravine leading up to them. After ascending for seven miles, we were gladdened by the sight of a little water trickling over some rocks. The first glance satisfied me that all was right, and in a few minutes holes were dug in the dry bed, which quickly filled with good spring water.

The water question being thus satisfactorily decided, a messenger was sent back for the whole party, while we continued our ride for the purpose of exploring the mountains, and of finding a cañon supposed to cut through them near our point of junction. We had received very conflicting reports about this range (the Burro Mountains). At a distance of some twenty or thirty miles it does not appear an imposing obstacle, for it seems to consist of three mountain masses, united by two long low ridges ; but on approaching these ridges they turned out really to be only long undulations of the plain, which hide from view very rough and formidable mountains behind them. Our first surprise occurred when on reaching the top of the ridge, we found the real mountains still in front of us. We pressed on, however, and after a few hours' more riding the crest of the main range was gained and one of the grandest panoramas I have ever seen was disclosed to us on all sides.

To the south lay numerous isolated ranges and peaks whose names we did not know, stretching far into old Mexico and rising out of the great Madre Plateau, which lay between us and them like lofty rock islands from a motionless sea. To the south-east the graceful Florida Mountains retained their usual outline, while far beyond them the curious peaks of the Organ Range, whose fluted basaltic columns justly suggest the name, were distinctly visible near the horizon, although situated east of the Rio Grande more than a hundred miles

istant from us. Due east of us lay the range we had left, ith Cooke's Peak rising nobly from its centre, and the exit of ir pass (Palmer's Pass) distinctly visible. Still following the rcle towards the north, the confused mass of the Miembres ountains came into view; then those of the Santa Rita and inos Altos, semi-detached portions of the same. Quite to e north, twenty or thirty miles distant, some very high ow-capped mountains were conspicuous, forming part of at great system of mountains—the Mogollon Ranges, north the Rio Gila, the home of the blood-thirsty Apache—which s never yet been explored.

The summit upon which we stood was, in fact, the dividing lge of the North American continent; the little water-course our feet was the first we had reached which flowed down e slopes leading to the Pacific; and the broad arid plains hich lay between us and our next obstacle to the westward ve a most extensive forecast of our future course. Nearly rty miles of almost complete desert, with little chance of a op of water, formed the undulating plain between us and he Peloncello Mountains. To the south-east a secondary nge, called from its conical peaks the Pyramid Range, filled b a part of the centre of this vast tract. Our field of vision d not even end with the Peloncello Mountains, for Juan rrolles, our guide, pointed out in the dim horizon, far beyond em, the rounded peak of Mount Graham, and the two sharp ads of the Dos Cabezas, the most prominent landmarks in e Pina-leño Range, and the boundaries on each side of Rail- id Pass. These ranges all lay far below us; they evidently se from a much lower level, and seemed to show, even to eye, that the ground sloped rapidly down towards the west. extensive a panorama as that which I have attempted, wever feebly, to describe, could never be witnessed in

Europe, or in any country where the atmosphere is much impregnated with moisture. For more than one hundred miles in almost every direction, nothing seemed to limit the extent of our vision but the incapability of our eyes to distinguish objects which were rendered too small by their remoteness.

Our guide knew the cañon we were in search of, and brought us next day directly to its head. It was not by any means a gap in the range, but only a large and well-defined gorge on the western sides. We followed it down to the plain. Two miles from the summit a large spring of clear cold water flowed from beneath a perpendicular mass of rock and formed a stream, which we followed until the cañon, e out by it, became so narrow and so filled up with rocks a vegetation that we were obliged to bear away to the rig and strike it again lower down. The stream had disappear in the interval, and the cañon from this point gradual widened out, lost its fertility, and entered the plain as a d open valley, trending towards the Gilas, scarcely twen miles distant. The length of this cañon, from its head abo the spring to its entrance as a cañada or valley on the pla is about thirteen miles. For half its course many large a beautiful trees adorn the path, amongst which we recognis sycamore, a very beautiful species of evergreen oak mu resembling holly, a black walnut (*Juglans Whippleana* rough-barked cedar (*Juniperus pachyderma*), pines, piño acacia, cypress, mezquit (*Algarobia glandulosa*), plum, a several species of cactus. An Indian trail led through t entire length of the cañon, including the two miles of ver narrow gorge, and also over the hill, avoiding it, which latt route we adopted. It was evident from the recent pon tracks that the red men still used it, and were probabl

is well acquainted with all our movements. Other signs were hur recognised by our guide, such as bunches of grass tied up limi and made to point in particular directions, and were looked eye pon as conclusive evidence of the activity and watchfulness by f our hidden, but probably ever-present, enemies. Game as abundant: two kinds of quail, black and white-tailed of, eer, bears, beavers, squirrels, and hares innumerable. Ex- by ensive fires had burnt down the bushes and laid bare large l-defi racts of land all along the base of the mountains.

n to While taking advantage of the delay, which the diffi- of dulties of the country necessitated, to enjoy a little deer- of walking and grouse-shooting, Lieutenant Lawson (who añon ommanded our escort) and myself were attracted during our ocks rambles by a curious wall of rock which fringed, like a he ri rap-dyke, the summit of a rather lofty range of foot-hills. appe On reaching the top we found that it consisted of a thick gradu stratum of marble, which had been tilted up vertically as d to the height of from 7 to 20 feet above the ground, and two that it extended for miles both ways along the hill-tops. ad sh This wall was beautifully variegated with white, grey, and the pi ed marbles, and presented the finest as well as the most large angular exposure of the kind I have ever seen. In many recogn aces through the mountains we found quartz ledges, giving ak in od indications of gold; and near the marble wall a vein of ipplea alena cropped out, of considerable width. Over this vein I pin ot a new and beautiful species of mountain grouse.

lum. Four days were occupied in trying to find a good pass rough rough the range, but our efforts were useless. We found, s of ter surveying to the summit of the ridge which skirted the hich l se of the mountains, that it was 1,208 feet higher than Ojo ent liente, twenty-three miles distant, and that the average prob ade for the last three miles had exceeded 160 feet per

mile, and this, too, before the mountains themselves had been reached. These Burro Mountains were not, as they appeared to be, an ordinary range rising from the plain, but the crowning ridge or summit of the great continental water-partings; and, although they rose from a much higher base than the ranges to the east and west of them, the slope up to their sides was not rapid enough at first to be distinctly apparent without the aid of our surveyors' levels. Nothing remained for us, therefore, but to abandon the line which we had been surveying, and to pass round the southern extremity of the range, twenty miles distant, by the great Madre Plateau, in which level district Mr. Runk's party was then at work.

A march of seventeen miles parallel to the mountains brought us to Soldier's Farewell, a solitary ruin which was once a station on the mail route during the short time it was established along the 32nd parallel. Two miserable water-holes are the great sources of attraction in this place. We feared they might be empty, as it was the end of the driest season of the year, but a shower of rain early that morning had providentially filled them partly up again. While we looked at the thick green puddle, full of creeping things, slime, and all sorts of abominations, from which we had to drink, a feeling of dread for the future involuntarily crept over us.

Oct. 31.

The whole country had changed, for we had at last entered that vast plateau upon the 32nd parallel which had so long been considered the only practicable highway for a railway route across the continent. The Madre Plateau is a vast plain, extending from the Rio Grande on the east for 3° westward, and separating the Rocky Mountains from those of Mexico. How thoroughly I pity the lover of the beautiful in nature who is obliged to traverse this fright-

ful plain from El Paso on the Rio Grande to Apache Pass! Although the mountains were still close to us, the landscape was as dreary as could well be conceived. At the bottom of a hollow caused by some broken ground lay the two putrid water-holes or ponds, overlooked by the tumble-down walls of a coralle and ranche. Before us extended an endless parched-up waste; some places were covered with poor grass, others were perfectly bare, and as the wind swept over them, clouds of dust were driven along or whirled up into the air like pillars of smoke.

From Soldier's Farewell we marched westward to the next water-hole, "Barney Station" (twenty-one miles), also an uninhabited ruin like that we had left, and, if anything, more dreary. There were no mountains near it, the land looked a dead level on every side, and not far distant towards the south lay what the Mexicans call a huge "playa," or dry lake. Over such a tract you may travel fifty miles in a straight line without crossing a water-course. When it rains the water collects in whatever part of the almost mathematically level flat happens to be slightly depressed, and here often covers many square miles of land to the depth of a foot, or even less. In such places even the scanty grass of the desert will not grow, and the whole earth becomes covered, as soon as the rain-water has evaporated, with a hard white shining crust, resembling cracked china, thus forming a "playa."

The water-hole here (Barney Station) was even more disgusting than those we had left, for it served to water, not only the men and stock of the "bull-trains" and troops which passed through the country, but all the wild animals dwelling within a radius of many miles. Flocks of birds, large and small, kept going and coming all day long. It

was a beautiful sight to see them all swoop down together like a sheet of feathers, flutter for an instant over the pool, and then flit away. At sunset might be seen at a great distance a V-shaped figure approaching from the clouds: this would be a flock of ducks, geese, or teal, coming for their evening bath. Unhappy stags and herds of antelope would stealthily approach, and, not liking the look of the intruders, make off again. Not so the wolves and coyotes; these fellows seemed to suffer frightfully from thirst, for after we had been camped for a few hours they would become so bold, or rather so eager for water, that neither the whiz of our bullets about their ears nor the crack of our rifles could keep them away from the pool.

The extraordinary vividness of the "mirage" is one of the great peculiarities of this region. We recognised it often on the plains of Western Kansas and elsewhere, but it is not seen to perfection until the Madre Plateau is reached. Half an hour after sunrise is usually the best time to watch for it; then the distant mountains become distorted into the most grotesque and fairy forms. Magnified to many times their natural size, they appear lifted into the sky, and are there cut up, sometimes horizontally, sometimes vertically, by the peculiar magical haze which surrounds everything. Often they look like terraced citadels; sometimes the phantasm takes a pillared form, and presents to the eye ruined temples like those of Greece or Egypt. This is not only the case with the mountains, for at a little distance everything appears distorted; the horses are changed into giraffes, the tents become elongated into snow-capped peaks, while the tufts of grass and the meagre scrubby vegetation are transformed into noble forests of gigantic trees; every little "playa" becomes a beautiful lake, from the waters of which are seen reflected

the magic transformations into which all surrounding objects have been changed. So complete is the delusion, that I have often remarked to a companion, as we watched the horsemen ahead of us dashing through the midst of a phantom lake, in which waves, shadows, spray, and sunlight were all portrayed to perfection, "How is it possible thus to disbelieve one's senses in broad daylight?"

Barney Station is 4,211 feet above the sea, which is about the average height of the entire plateau. During the two days' march from our camp at the foot of the mountains we had descended 2,000 feet.

The sun was setting, and I was just taking a striking picture of desolation, or rather a photograph of Barney Station in ruins, when two strange objects appeared in sight. The one developed as it approached into a most dilapidated and old-fashioned coach, the other into an equally shaky spring-cart, and both were drawn by mules; two ladies occupied the former and half-a-dozen armed soldiers the latter vehicle. The gentlemen of the party, four in number, rode on each side of the coach, and completed the travelling "outfit."

Between the Rio Gila and the Mexican boundary, Arizona boasts of possessing one town, Tucson, on the Santa Cruz River, now, I believe, the capital of the territory. This was the destination of one of the fair travellers, a very pretty girl of sixteen, in whose veins the fiery blood of Spain had been softened, but not obliterated, by union with that of our own; she was returning with her father, an American, having just completed her education at St. Louis. Her companion was on her way to join her husband at Fort Bowie, and to share with him the anxieties and solitude of a post which guards the most dangerous pass in Arizona—Apache Pass. We

shall presently get a glimpse of what such a life is. It is easy to fancy what extreme pleasure the presence of our fair friends gave us. They were just entering the most dangerous part of their journey, where defiles had to be passed through, in which half-a-dozen soldiers and four civilians were a very insufficient escort, so that we were delighted to render them the protection which increase of numbers afforded.

On the afternoon of November 2nd, Mr. Runk's party came in sight, and completed their survey up to our camp that evening. Since parting from us a month ago they had met with open country, and no obstacle but Cooke's Cañon, through which their route lay. The Apaches had succeeded in driving off half their oxen, but beyond this all had gone well with them. Altogether we mustered a large party at Barney Station, and notwithstanding the mud puddle of which we thankfully drank, and the dreariness of the place, we managed to make ourselves exceedingly jolly. A little whiskey was discovered amongst "somebody's luggage;" the fatted calf, our best bullock, was killed and cooked; and many good stories and bold adventures were told around the camp fires.

Nov. 2.

A few figures will give the result of Mr. Runk's survey :—

	Miles.	Elevations. Feet.
Fort Craig (on Rio Grande)		3,857
Fort Craig to Fort Cummings (foot of Cooke's Cañon)	104·1	4,094
Summit of Cooke's Cañon	3·1	4,384
Foot of ditto	3·6	4,046·7
Continental divide (Madre Plateau at the foot of Burro Mountains)	36·0	4,452
Barney Station	22·0	3,502
Total from Fort Craig to Barney Station	168·8	

After leaving the Rio Grande his party had found the country

weird and desolate in the highest degree, and very similar to that last described.

Next morning, Lieutenant Lawson, commanding the escort, started with nine of our men and some empty wagons to Fort Bowie for rations and forage; and our new friends, with Colton and myself, completed the party by joining him also.

For twenty-one miles we traversed the level plateau, and then entered the next range of mountains—the Peloncello Range; halting a short distance within the pass leading through it, known as Stean's Pass. At this spot was situated the only spring to be met with on the road. It was, however, dry on the surface, and we had not time to deepen it. A beautiful conical mountain—Stean's Peak—forms a good landmark for this pass and spring. From Stean's Peak to Fort Bowie, in Apache Pass, leading through the next mountain range (the Chiricahui), the distance is thirty-six miles, without a drop of water, making in all a "jornada" of fifty-seven miles without one drinking station.

We rested until sunset at Stean's Peak, in order to avoid the heat of the day, and then started through the grandest part of the pass. The moon was almost at its full, the night was perfectly calm, and a liquid softness smiled upon everything. These mountains were infested with Indians; and the ladies were rather nervous, as now and then we passed through a narrow gorge, or under some lofty crag. To keep them in good heart, we sang songs and choruses, in which they soon joined; these were re-echoed again and again from side to side. The cavalry rode in front, and the wagons brought up the rear. Now and again the horses' hoofs would ring out and rattle over a bed of rocks; or the moon, obscured behind the mountain, would suddenly throw a flood of light over the white wagons and glistening rifles of our party.

The air had become very cool and refreshing, and the scenery for at least eight miles through the pass was so grand in its rugged barrenness, that, seen at such a time, it left an impression never to be forgotten.

The accompanying engraving, drawn by R. P. Leitch, is taken from two photographs which I made of the pass a few days later, and is so true to nature that it brings back the scene with wonderful vividness to my mind.

A march of five hours, at the rate of four miles an hour, brought us to the Cienega de San Simon, where, as the name Cienega implies, there is at some seasons of the year a small marsh, with a little stream running through it. We found, as we had expected, no signs whatever of water, but plenty of good grass; so here we made our midnight halt.

Before daybreak next morning our fires were rekindled, and our coffee made, for we had carried wood with us from the pass; and before the sun had peeped over the eastern mountains we were again on our way.

Amongst the party was the mail contractor for this road. Twice a week a mail carrier rides from Tucson to Fort Bowie, 106 miles; another then carries the mails on to Soldier's Farewell, eighty-six miles; where he meets the solitary mail carrier, who had come from La Mesilla, 129 miles to the eastward. The mail-bags are exchanged, and each returns the way he came. The men who thus pass unguarded backwards and forwards through a hostile Indian country require no small share of reckless bravery. Their pay is high, being 200 dollars in gold (or £40 a month). The contractor told me that a year never passed without one or more of his mail-carriers being "jumped" by the Indians, under which circumstances he always made a point of carrying the mails himself for a fortnight at least, over the very section of road upon

STEAN'S PASS BY MOONLIGHT.

which his man had been killed. He had never any difficulty afterwards in finding some one else sufficiently reckless to risk his life for the ordinary remuneration.

During the latter ten miles of our march most of the route lay through thick brushwood, composed of mezquit, grease-wood (*Obione canescens*), two kinds of aloe, yucca, a very large species of prickly pear, and other cacti, besides many other kinds of thorny bushes, which formed an almost impenetrable thicket, very well adapted for an ambuscade. Here and there my companion pointed to spots where one or other of his mail-carriers had been killed, or where he himself had been "jumped," and related how he had escaped at this place by the speed of his horse, or at that by good service done by his revolver.

Many of his anecdotes were most exciting, yet there was no apparent tendency towards exaggeration; while, on the other hand, he openly avowed that the more you have to do with Indian warfare, the more you dread the Indians, and try to keep out of their way. "Men may be very brave at first, but the continual anxiety soon takes the dash out of them—you bet!" and this avowal came from a man of undoubted courage.

On reaching the mountains at the entrance of Apache Pass, he pointed to a foot-hill on the right, and gave me a little sketch of the Chiricahui Apaches during his residence on the spot.

Until the winter of 1861-62 the Apaches of that range (Chiricahui Mountains) had not shown any very determined hostility to the Americans, and the mail company, for the two years during which they ran coaches along this route, kept on good terms with them, by giving occasional presents of blankets and food. At the breaking out of the

rebellion, however, an upstart Federal officer, named Barkett, was sent to take charge of this part of the country, and soon after his arrival at the entrance of Apache Pass, where he formed his camp, some Mexicans applied to him about a boy of theirs, whom they suspected had been stolen by the Apaches. Barkett summoned the chief, Cachees, and his head men to the camp. Being on friendly terms with the troops, the red men immediately responded to the summons. Cachees and his six men, however, positively denied the charge of kidnapping the boy; upon which orders for their arrest were immediately given. Cachees in a moment slit open the canvas of the tent with his scalping-knife, and escaped; his companions were all secured. A man named Wallace, who had long lived on the most amicable terms with the tribe, volunteered to go alone and treat with them. He did so, and sent back a message to Barkett that, in his opinion, the boy had not been stolen by them, but added that he himself was retained as a hostage in their hands. Barkett became furious, and swore that he would hang the red men if the boy was not returned that night; and he kept his word. On the heights to the left, those half-dozen savages were strung up next morning; and, shocking to relate, poor Wallace, who had trusted so implicitly to the personal affection shown for him by the red-skins, was immediately hanged on the summit of the heights on the opposite side of the pass. This tragedy over, Cachees and his entire band fled back once again to their mountain fastnesses, never more to come in contact with the white man, unless in the execution of their unquenchable revenge.

Fort Bowie is situated about six miles up the pass. It consists of a small collection of adobe houses, built on the summit of a hill, which rises as a natural look-out station in

the centre of the defile, and commands the road both ways for two or three miles of its length. The only officers at the time of our visit were Lieutenant Carrol, Lieutenant Hubbard, and the resident surgeon; the only troops, one small company of forty men. The officers insisted upon Lawson, Colton, and myself sharing their quarters; they had not had a visitor of any kind for months, and had almost forgotten that the world was inhabited.

After luncheon I strolled out upon a higher hill-top to choose a good position for taking a photograph of the fort and pass. The view was a very beautiful one, for we were hemmed in on all sides by lofty mountains, the most conspicuous of which is Helen's Dome. Some two miles distant in the pass, the sheep and oxen belonging to the fort were peacefully grazing, when suddenly I perceived a commotion amongst the garrison. All were hurrying to the highest part and looking towards the cattle, from which direction I heard a few shots fired. It appeared on inquiry that the mail-carrier, going west to Tucson, had only gone on his way a short distance past the cattle, just beyond the turning in the road which hid him from the fort, when he suddenly came upon two Indians who were stealthily creeping up towards the stock. Shots were exchanged, and he immediately turned back to give the alarm to the men guarding the cattle, and to the sentinels at the fort. The Indians showed themselves two or three times in the open, and then disappeared. It was useless for us, with our wearied horses, to join in the chase after a couple of naked red men, so we remained behind.

So poorly supplied was this little fort, if such a term may be applied to a collection of mud huts, that two horses represented the entire stock. It was customary to keep one of

them with the herd and the other in the stable, and the favourite chestnut of the lieutenant's, a high-mettled, splendid creature, happened this day to be at home. It was immediately saddled. Carrol was quite young; he had only seen eighteen summers, and looked even younger, for his hair was very fair, and he had not the least tinge of whisker on his smooth cheeks. I remember watching him spring with one bound from the ground into his saddle, wave his hand merrily to us, and then dash down the steep winding road which led from the fort to the pass below. Again we saw him racing as fast as the horse could gallop along the pass after the mail-carrier, who, being previously mounted, had started off with the infantry. I went back to my photography, for there were many views I wished to obtain; but my friend, Lieutenant Lawson, could not remain long inactive. He was a great character. Although very short, quite grey with years, and not in the least like a military man, he was the gamest little fellow I ever met. So fond of soldiering did he become during the war, that he could not settle down again to business. Though one of the steadiest of men, and a religious man also, a great rarity out West, he actually left his good wife and family comfortably settled at Cincinnati, changed his social position from wholesale hardware merchant and ex-colonel of volunteers to simple lieutenant in the regular army, and started to join a Western regiment. The merest chance of a brush with the Indians was irresistible; so he ordered out his six men and their six jaded horses, and off they went down the winding road, and then away out of sight along the pass.

As the afternoon went by, most of the infantry returned by twos and threes, and we were just sitting down to dinner when Lieutenant Lawson and his men rode into the fort.

They had hunted about all over the mountains and through the ravines, but had encountered no savages, nor even caught a glimpse of a red-skin. Carrol, to our surprise, was not with them. We made inquiries, and found that all had reported themselves except the lieutenant and the mail-carrier. We questioned those who had gone the farthest, and a shepherd just back from over the hills; these agreed that they had heard the distant report of fire-arms, coming apparently from the western plain. This was the direction the two red-skins had taken. So we saddled our horses without a moment's delay, and, with sickening forebodings in our hearts, started across the mountains to the western plain. We scrambled up the base of Helen's Dome, which was so steep as almost to baffle our horses, well trained as they were to all sorts of bad places; then, after skirting the side for some distance, we crossed a ravine to another mountain slope, down which we plunged, over large blocks of limestone and marble, leading our horses by the bridles, and clambering through them as best we could. Every moment was precious, for the sun had almost set before we reached the plain.

Then we spread out in line, nine in number; for there was no enemy in sight, and our only hope was to strike the trail; for we knew they must have passed somewhere in this direction. Every eye was fixed on the ground, every blade of grass was closely scanned; our souls were in our eyes. At last one marked "pony tracks;" then another called out, "This way they lead;" not two, three, or four tracks, but many; perhaps a dozen. The white men had evidently followed too far in pursuit, and falling into an ambuscade, had been cut off from their comrades. Most of the hoof-prints were naked, but two sets were shod. These were certainly those of the missing horses. We could not hurry on very

rapidly without losing the trails, and yet there was not half an hour's daylight. For three miles farther we pressed on, carefully tracking our way. We passed a spot much trampled down and blood-stained. Here the poor fellows had made a stand; had probably tried to cut their way back through their enemies, who were driving them from the fort. A little further, and all hope of one life was gone. The mail-carrier lay stretched upon the open plain—scalped, naked, and mutilated—in the setting sun. This poor man wore whiskers, and the savages produced even a more startling effect than usual by scalping one of them. Thus half of the face was stripped of skin, and the bleeding muscles were laid bare.

We could not stop a moment; but, dragging up two huge magay plants to mark the spot, we followed the pony tracks. The sun sank, and it was only by the red glare thrown up from behind the horizon, and reflected by the bare mountains of rock to the east of us, that we were able to track our way. So difficult was it at last that we began to despair of ever learning the fate of poor Carrol. We longed to see his dead body; for the idea of his being taken alive to be tortured and roasted over a slow fire, whilst the fiends danced round him, and exulted over his agony, was the one dread consummation which made our blood run cold. No one spoke, for we all knew well that such would be his fate if that sun had not shone upon his corpse.

As we took a last searching look over the dimly-lighted plain in front of us, we saw an object move slightly on the grass. We quickly rode towards it, and in half a mile further we found that it was the faithful dog of the lieutenant. He was guarding the stiff and lifeless body of his master. So we wrapped the naked body in a saddle-cloth, and tied it on a horse.

But for the moon, we should not have found the spot where the mail-carrier lay. We placed him also on another horse, and then turned our faces towards the pass. The wolves were already gathering round the spot, and the night winds were blowing up cold and chill. The night before, that same beautiful moon which now shone peacefully down upon us, had lighted us through the noble gorge in the Peloncello Mountains, while we sang choruses and enjoyed the grandeur of the scene. This night she lighted us through another gorge, in another range of mountains—Apache Pass—but how different were our feelings as slowly we marched in mournful silence over the nine miles which led up to the fort! Thus ended the 5th of November.

Next morning we buried the poor fellows in the little graveyard amongst the mountains. The doctor read the burial service, and Lieutenant Hubbard, Colton, Lawson, and myself were the chief mourners. When the final volley had been fired over our two poor comrades, and I turned to glance at the tablets of their companions, I read on the wooden crosses over every grave but one, the same sad story of their fate—

"Killed by the Apaches."

When Cachees' six best warriors were wantonly hanged five years before, that bold chieftain vowed that for every one of his lost comrades a hundred white men should die by the hands of himself and his band. Two more scalps were thus added to the long strings of those which already hung from the belts of the Chiricahui braves.

CHAPTER IV.

FROM APACHE PASS TO THE ARAVAYPA CAÑON.

Return to Eicholtz's Party at Stean's Pass, and all proceed thence to Railroad Pass in the Chiricahui Mountains.—The Valle de Sauz.—A Curious Mirage.—The Physical Geography of our Route through Southern Arizona.—Railroad Pass.—Change of Escort.—Join Runk's Party and conduct them to Railroad Pass.—A Ride of sixty miles, and the Incidents on the way.—**The Cañada of the Aravaypa.**

Total distance, 211 miles.

LEAVING our disconsolate friends to their solitude, we retraced our steps with supplies to the foot of Stean's Peak, where we found our party encamped, and the surveyors at work along the pass. This pass through the Peloncello Range, however, proving unfit for a railroad, we did not remain to complete its survey, but started next morning for the Chiricahui Range. The Puerto del Dato, or Apache Pass, was known without doubt to be impracticable; but about twenty miles north of it lay a depression in the mountains, with so gradual an ascent and descent that it received the name of Railroad Pass from its discoverer, Lieutenant Parkes.

Nov. 6.

So after a few hours' photographing in Stean's Pass, taking a special view of "El Pecacho de Santa Lola," a lofty peak christened by us in honour of the young lady we had escorted to Fort Bowie—who, by-the-bye, had to cross the fatal ground the day after the catastrophe just related, on her way to Tucson—I proceeded with the rest towards Rail-

road Pass. Our route was a perfectly straight one; direction, 10° south of west, across the flat Valle de Sauz; the distance from pass to pass being forty-six miles, odometer measurement. No water was to be found on the way, but we had no difficulty in making the distance in two days with one dry camp. As for the Rio de Sauz, I have been unable to find it anywhere but on the map, although I have crossed the valley five times in different places. A river *ought* to flow through a valley thirty miles wide and 120 long, but with the exception of an occasional dry water-course of most insignificant dimensions, trending in a north-west direction towards the Rio Gila, I could discover no evidence of one. Even when we had reached Railroad Pass we did not find water without considerable difficulty, so that instead of camping in the pass itself, we were obliged to follow a dry water-course for six miles, until we reached a spring issuing from the side of the lofty Dos Cabezas (two heads).

Our guide, Juan Arrolles, while following up this arroyo, was fired at by some Apaches from the summit of a hill overlooking the spring. Although we galloped up immediately on hearing the shots, we could not find a trace of the savages.

I must not forget to mention a very curious mirage which Mr. Eicholtz and myself observed early in the morning, as we were approaching Railroad Pass. We were watching the gap in the mountains, for which we were making, when we observed between it and us a perpendicular cliff, in which the horizontal strata of the rocks were most distinctly visible. We were greatly disappointed; Mr. Eicholtz was almost alarmed; for if this was Railroad Pass, the easy slopes of whose sides had been so much extolled, there must be some mis-statement. Looking round, however, we noticed that

this perpendicular cliff not only extended across Railroad Pass, but formed the base of the mountains in front of us. We looked back, and there it was also, in exactly the same relative position at the foot of the range we had left the day before. Then the real nature of the illusion became manifest, for we had not climbed down any such obstacle; had it been a reality, we could not have overcome it without letting down the wagons and cattle by ropes; our dreaded barrier must therefore be a myth. And so it was, for in half an hour the cliffs had disappeared, and behold! a sloping grass-covered plain alone stretched out before us.

Let us pause for a moment at Railroad Pass, so as briefly to review the physical geography of the country over which we have so rapidly travelled, and to take a prospective glance at our future course.

The most northerly pass westward out of the Rio Grande Basin, practicable for a railroad, we found to be Palmer's Pass, through Cooke's Range, the most southern spur of the Miembres Mountains. Some eight miles south of Palmer's Pass, Cooke's Cañon was found to be practicable with a tunnel; but both passes could be avoided by going only six miles further to the south, and passing around the end of the range in the Madre Plateau.

The second range of mountains encountered was the Burro Mountains, along which runs the main divide of the continent. We found that it was impossible to build a railroad through these mountains, but there was no difficulty in passing south of them in the great plateau. I have spoken of passing out of the Rio Grande Basin, across Cooke's Range, and of crossing the continental divide to the Pacific slope over the Burro Mountains; I have not, however, stated where the drainage of the intermediate district goes to. The plain between these

ranges, limited on the north by the Miembres Mountains, forms part of the basin of the Laguna de Guzman, in Chihuahua, towards which, as I have before remarked, the Rio Miembres flows. The vast plain, the continuation northwards of the Madre Plateau, lying between the Burro Mountains and the Peloncello Range, is not inaptly called the Valle de los Playas, for playas are common all over it, while water-courses are few. The Rio Gila, and the mountains on the opposite side of that river, limit it on the north.

The minor upheaval, the Pyramid Range, may be called the third range encountered. Mr. Eicholtz's party passed around its northern extremity; Mr. Runk found Lightendorfer's well road an easy and practicable route through it.

Next comes the Peloncello, or fourth range. This is a fine range, but abounding in passes. The most northerly is Doubtful Pass; eight miles south is Stean's Pass; twelve miles lower, Runk's Pass; then comes the pass through which Lightendorfer's road leads to the Cienega de Sauz; and lastly, thirty miles still further south, Cooke's emigrant road passes through the range. Stean's Pass Mr. Eicholtz found impracticable, but that discovered and adopted by Mr. Runk answered every requirement for a railroad.

Having crossed the Valle de Sauz, however, we encounter the first range (Range No. 5) of that extensive cordillera which appears to stretch northward to the plateau of the Colorado beyond the 35th parallel, and to be continuous southward with the Sierra Madre of Mexico proper. The general trend of the ranges forming it is, like most of those in this part of the continent, north-west by south-east. Exactly in front of our course westward, the cordillera consists of three parallel ranges; the Pina-leño and the Chiricahui forming the first continuous range, the Sierra Calitro

the middle, and the Sierra de la Santa Catarina the outer or most westerly. Between these ranges are two troughs: the eastern trough is called the Valley of the Aravaypa, north of Railroad Pass; south of that pass it goes by name of Sulphur Spring Valley. The western trough consists of the long narrow valley of the Rio San Pedro. Both these troughs were explored, and as no practicable pass could be found through the first of these ranges but Railroad Pass, and as that one was unusually good in every respect, this entrance into the first trough was made use of by both parties. From this point the parties again separated, the one under Mr. Eicholtz to follow down the first trough, through the stupendous gorge, the Aravaypa Cañon—a narrow passage cut by nature through the middle range—into the San Pedro valley to Camp Grant, a point sixteen miles from the junction of that river with the Rio Gila; the second party, under Mr. Runk, to deflect southward from Railroad Pass, to cut through the middle range (Sierra Calitro) by Nugent's Pass, and to follow down the San Pedro valley to the same point—Camp Grant—where the Aravaypa and Rio San Pedro unite.

One may naturally ask, How does the Rio Gila, in its course from east to west, make its way through the cordillera? This river strikes the mountains almost at right angles, and passes through them in a succession of cañons, three in number, varying, as far as has yet been ascertained, from twelve to twenty-five miles each in length.

At Camp Grant we are still in one of the troughs (the San Pedro valley) between the mountains; one range more still bars the way, and there are three routes by which it is possible to escape. The first and most northerly is by following the Rio San Pedro down to the Rio Gila, and then passing westward along the latter stream through its last cañon, twelve

miles long; the second is to cross the mountains by a natural pass almost due west of Camp Grant, over which a road leads to Sacaton, on the Gila; and the third way is to cross by another pass seventy miles to the south, which leads from the San Pedro crossing (a good ford about latitude 32° 5′), *viâ* Cienega de los Pimas, to Tucson.

The ranges of the cordillera crossed, there are no more mountains of any magnitude to be found between them and the Sierra Nevada of California. The whole of the intervening country on this parallel is parched, worthless, and nearly all desert.

After this digression, let us carry our minds back again to camp at the spring in Railroad Pass, and continue the narrative of our daily life.

Mr. Eicholtz recommenced his survey at a fine cotton-wood tree, a conspicuous landmark 14·33 miles east of the summit of the pass. From this point the twin peaks of the Dos Cabezas appeared to great advantage. The mountain itself forms the southern boundary of the pass, and the northern end of the Chiricahui Range. Opposite the Dos Cabezas, and forming the northern boundary of the pass, is another fine mass, named Mount Graham, which is the southern extremity of that continuation of the range northward called by another name, the Pina-leño Mountains. The length of the pass is fourteen miles—seven up and seven down; its width averages from eight to ten miles. It looks more like a plain which has been slightly uplifted than a pass through a range of mountains, covered as it is with magnificent grass, and devoid of trees. It is grooved in its centre by a broad, smooth, grass-covered arroyo, which commences as the dry bed of a little stream near the summit. A wagon-trail, known as Leache's Old Road, traverses it; but when we

passed over it, this road did not appear to have been used for years.

Looking westward, straight through the pass, a very abrupt wall of mountains is seen exactly in front. This is the first view obtained of the Sierra Calitro.

In crossing the Peloncello Range, forty miles in our rear, we had passed the boundary-line between New Mexico and Arizona, and had entered the military district of California. A messenger arrived at our camp from Fort Bowie on the 11th, with orders for Lieutenant Lawson to proceed to the Cienega de Sauz with his detachment of cavalry, in order to meet those escorting Mr. Runk, so that they might both be relieved at that point by a company of Californian troops sent there for the purpose. We were very sorry to lose Lieutenant Lawson, whose age and experience we appreciated so much, and whose firmness and kindness towards his men kept those wild fellows perfectly under command. This change of troops, however, gave me an opportunity of joining Mr. Runk's party, and of guiding them direct to the spot where they were to unite their line with that of Mr. Eicholtz.

On Tuesday, the 12th, we marched to Fort Bowie—twenty-four miles; and on Thursday joined Mr. Runk's party at the Cienega. By Saturday at sunset, with great exertions on the part of the surveyors, who were actually at work each morning at sunrise, we completed the line to Railroad Pass, and camped that night on the old camping-ground, which had been vacated three days previously by Mr. Eicholtz. Many square miles of the plain passed over were covered with mezquit bushes, which had to be cleared away, in order to adjust the levels, &c., thus causing considerable delay. In many places there was an abundance of good grass, while

some parts were quite bare, and no signs of water were anywhere to be met with.

The result of the survey from Barney Station was the following:—

	Miles.	Elevation. Feet.
Barney Station		4,210
Summit of Pyramid Range	8·2	4,610·5
Eastern foot of Runk's Pass (Peloncello Range)	12·3	4,174
Summit of Runk's Pass	3·9	4,166
Eastern foot of Railroad Pass	38·9	4,035
Summit of ditto	6·9	4,411
Total distance from Barney Station to Railroad Pass	70·2	

The object of my visit to Mr. Runk and his pleasant party having been accomplished, I started next morning with two cavalry men to catch up my own party, which I expected to overtake either spending the Sunday at Kenedy's Spring, thirty miles down the Aravaypa valley, or, if the ground proved rough, at Bear Spring, a few miles nearer.

Nov. 17.

As we followed the wake of the wagons, we remarked numerous tracks, which could not have been made by any of our party. These were the footprints of at least a dozen pair of moccasins, besides the unshod tracks of many ponies, and all had been made since our party had passed over the ground. Could a band of Apaches be closely following our men in the rear, prepared to take advantage of the slightest opportunity for murder or plunder? If so, how could we, only three in number, manage to run the gauntlet? These were our thoughts as, mile after mile, all through the day we followed the mysterious trails. There could be no doubt of the presence of Indians all through these mountains; for if we had not had so melancholy a proof of that fact at Fort

Bowie, we had passed no less than four well-worn Indian trails, which crossed different parts of Railroad Pass, from one part of the range to the other. This was, in fact, the highway leading from the Sierra Blanca and other mountain fastnesses north of the Gila, to the State of Sonora, where those sons of plunder were wont, ever since the strong military rule of Spain had ceased, to make constant raids upon the helpless Mexicans.

About seven miles from the summit of Railroad Pass we crossed a large playa, about three miles wide, and two miles further on we passed the remains of one dry camp. The valley was very level, and for the most part covered with fine grass, but not a trace of a central river-bed was to be seen. We kept close to the base of the Calitro Range, because most of the springs lay on that side, and by half-past five the few cotton-wood trees which mark the situation of Bear Spring came in sight. On arriving there, we found by the wagon tracks that they had not halted; so on we rode without a moment's delay, but did not reach Kenedy's Spring until the night had overtaken us. All was silent there also. After two hours' more riding we decided upon a halt, to rest our horses and get a snatch of sleep. We struck a match and examined the track. There were the pony and moccasin tracks as visible as ever; so, for precaution, we went a little way off the road before we lay down to rest.

Clouds in the meantime had covered the sky, and as luck would have it, it actually rained. A shower had fallen three weeks before in the Burro Mountains, but that was all we had had for two months. Cold, hungry, and wet, neither rest nor sleep was possible, so we soon saddled up again, and went on our way. It was so dark that the road made by our dozen wagons, like all other

objects, was quite invisible, so that we were obliged to leave it to the horses to keep the track, which they did apparently without difficulty. Hour after hour passed away, and on we rode in the pitch darkness. By the help of a match we again examined the trail, and again discovered that even since the rain had fallen, while in fact we were resting, two pair of fresh moccasins had "made tracks" over the road. Was it possible that we also were being followed?

The moon rose and the clouds broke a little, so that now and then a glimpse was gained of the world around. On each side towered up a mountain range; between them lay the flat, monotonous plain. At last we came to a sudden depression or groove in the centre of the valley; the land had sunk from beneath, and formed a second little valley at the bottom of the first. This was the commencement of the cañada of the Aravaypa. We descended into it, and followed along the dry, grass-covered bottom until the sides had assumed the magnitude of bluffs. The ground became more fertile; brushwood, and even willows, grew in places; and soon a well-defined water-course could be made out running along one side of us.

Suddenly, about three o'clock in the morning, there appeared close before us out of the darkness a white tent and a smouldering camp fire. Thinking that our camp had been at last reached, I trotted briskly forward, calling out "Friend!" so as to warn the sentinel and prevent his firing at us. But to my surprise I found myself in the middle of a motley group of brigand-looking fellows, who started up in the greatest consternation, and pointed their long rifles at us. They had sense enough, however, to see that we were not red men, and we soon discovered them to be a band of Mexicans. On their feet were the moccasins which had caused us so much anxiety, and not far off stood the ponies, whose unshod

hoofs had completed the deception. Mutual explanations as to who we were quickly followed. We warmed ourselves by their camp fire, and gladly accepted from them some hot coffee and a loaf of bread.

The circumstances which had brought these Mexicans to such a place as this are easily explained. They had come all the way from Toas, east of the Rio Grande, a party of twenty, and being bound for Southern California, had taken the 32nd parallel route. Although not acquainted with the country, they had made their way very well by following the mail-road until they reached Stean's Pass. But here they found two roads, one going to Fort Bowie, and the other, well marked by our wagons, leading to Railroad Pass. This latter they had taken, and, once on our trail, they had followed it up to this point. They did not know where they were, but felt quite sure that so well-marked a trail must lead to California. Daylight soon came, and brought to view two American prospectors, who had joined the Mexicans for mutual protection. The goods and chattels of the party consisted mostly of buffalo robes, and were carried on the backs of mules and ponies, sixteen of which formed their entire stock. As we considered that such a reinforcement, tolerably well armed as they appeared to be for Mexicans, would be a great addition to our own party, we advised them not to return, as they had come so far from the overland route, but to push through the Aravaypa Cañon in company with us. This course they agreed to adopt.

Again we mounted our weary horses, and left Eureka Spring, which was warm and sulphurous, and neither fit for man nor beast. Ten miles further we rode before the shouts of the surveying party told us that our long weary journey was drawing to a close. About this point (ten miles from

Eureka Spring) we encountered a large spring, which bubbled up from the ground in the centre of the cañada; from it flowed a perennial stream of considerable volume, whose life-giving waters filled the valley below this point with thick luxuriant vegetation.

At last, when camp was reached, after a continuous ride of sixty miles from nine o'clock one morning until eleven o'clock the next day, and we dashed through the rivulet into the thick grove of cotton-woods which hid the tents from view, no small amount of anxiety was lifted from our minds. My readers can hardly appreciate what pleasure it was to see once more around me trees and flowers, to listen to the song of birds, the rippling of waters, and the subdued rustling of the leaves overhead; it seemed that the deserts had all been crossed, and that danger was but a dream.

A slightly elevated piece of ground at the back of our camp was covered with the stone foundations of many buildings, large and small. The divisions of the rooms and entrances could plainly be made out. Much broken pottery, such as the Pueblo Indians make, was picked up amongst the ruins; but no trace of recent occupation could be discovered. "Los Alamos Grandes" is the name we gave to this spot. It is only six miles and a half from the entrance of the cañon, which distance we travelled on the day following my arrival at camp.

With the help of the results attained by our surveyors, I can give a tolerably accurate account of the physical features of the trough between the mountains in which we have been travelling. I retain the word trough, in preference to valley, for reasons to be soon explained. After descending from Rail-road Pass to the centre of the trough (six and a half miles), and on changing our course towards the north-west, we do not continue to descend; but, on the contrary, in the first

twenty-two miles we rise again some 200 feet. At about this point we cross a divide, and commence the real descent towards the Rio Gila; or, in other words, we enter the basin of the Aravaypa. This fact is soon made manifest by the appearance of the cañada of the Aravaypa as a groove at the bottom of the trough between the mountains. From the commencement of this cañada to the point where its walls approximate so closely as to form the cañon proper the distance is 25·30 miles, in which interval the total descent is 1,104 feet.

As this great fall does not represent the slope of the trough between the mountains, but the gradual deepening of the groove in its centre (the cañada of the Aravaypa), it is easy to understand how the cliffs or sides of the cañada become higher and higher as we descend. Sometimes they approach each other, and form a natural gate or narrow passage for the river bed. Sometimes they recede to the distance of two or three miles apart. In places they have perpendicular walls. Often they become sloping banks, and being composed of soft, friable material, mostly drift, they are sometimes transformed by erosion into very picturesque objects, resembling forts, castles, long lines of earthwork, and the like, which are chiefly remarkable for the mathematical regularity of their outlines, thus giving a very peculiar appearance to the whole country, since the traveller is never out of sight of these singular formations; for no sooner is one passed than another appears at the next turning of the gorge. At the back rise the black shining walls and the deeply-serrated summits of the volcanic ranges on either side. These gradually approach each other until the trough itself becomes obliterated, and the walls of the cañada in its centre are of necessity merged into the mountain sides. At the point where the mountains seem to unite, the cañon proper begins.

Vincent Brooks Day & Son,lith

CHAPTER V.

THE ARAVAYPA CAÑON.

Preparations to advance through the Gorge.—A glimpse at the Country above.—Formation of the Walls.—First Night in the Cañon.—Difficulties of the Surveyors.—Remains found by us after a Massacre in the Cañon.—The Gorge increases in grandeur as we advance.—Animal Life.—The Vegetation.—Photographing.—The Surprise.—The Cañon becomes very narrow and tortuous, and the Perpendicular Walls exceed 1,000 feet.—A Change in the Rocks and Plants.—The *Cereus giganteus* and other Cacti.—Our Camps in the Cañon, and how the Evenings were spent.—Indian War-songs.—End of the Cañon.—Indian Trails and Apache Wigwams.—Reach Camp Grant.—Colton and I leave for the South.

Distance, 34 miles.

Nov. 19.

Camp having been pitched at the entrance of the cañon, a party was formed to make a preliminary examination of it, and to determine whether our wagons could be taken through or not. Two cavalry men were also despatched, with a guide, to Fort Goodwin, fifty miles distant—at the other side of the Pina-leño Range—to obtain, if possible, a few more troops; for our escort had been cut down, by the change of command, from thirty men with everything necessary for campaigning, to fifteen men destitute almost of everything. These matters having been settled, Stuart, our quarter-master, and myself started over the mountains upon two good mules, in order to obtain a view of the defile from above, and to study the general lie of the country. The scenery was wild and utterly desolate beyond the little narrow streak of beautiful vegetation which filled the gorge and the cañada leading to it. Not a tree was to be seen,

nor a single patch of green. The country seemed to consist of a succession of mesas, piled up one above the other, like terraced mountains, presenting from five to a dozen parapets. Volcanic force considerably assisted in producing the wild confusion which surrounded us; for many of the summits were formed of pointed masses of plutonic rocks which had been forced up from below, while considerable areas of surface had been covered with a thick coating of lava, the broken edges of which shone out smooth and black in the sunlight. The most prominent mass in the landscape—called, from its shape, Saddle Mountain—is probably an extinct volcano. It stands exactly in front of the trough between the mountains which we had left, and seems to be the chief obstruction which prevented the Aravaypa River from continuing its direct course into the Rio Gila, and obliged it to deviate from north-west to south-west; for looking over the dreary landscape in the latter direction, the rugged outline of the mesa country seemed to us less obstructed by formidable barriers on that side; while at our feet we could trace for miles the black cleft in the earth's crust which we knew to be the Aravaypa Cañon. With a good deal of climbing, we managed to enter a side gorge which debouched upon the main cañon, and by following its windings at last entered the latter about three and a half miles from its head, and then followed its course to camp, fully persuaded that if the cañon itself was impracticable for wagons, no way could be found through the country above it. A rapid exploration of a very few miles of the cañon proper was sufficient to prove that it would only add greatly to our difficulties to attempt to take our wagons with us.

On the third day the party from Fort Goodwin returned, bringing us some extra mules, pack-saddles, and thirty in-

fantry; so, having packed our provisions and other necessaries upon the mules, we severed our connection with the wagons, and commenced our journey through the gorge. The wagons, escorted by the infantry from Fort Goodwin, were obliged to retrace their steps and to travel southward to Nugent's Pass, through which they were able to turn westward into the San Pedro valley, and to follow it down to Camp Grant. *They* had to travel 150 miles to reach that point, whereas *we* were only thirty-four miles distant from it at the head of the cañon.

Nov. 22.

Never shall I forget the six days and five nights we spent in cutting our way through this wonderful defile; and, though the remembrance of it cannot but be a vivid one, I feel that it is quite impossible to give anything like a fair description of it.

Guarding the narrow entrance rises a conic hill, to which we gave the name of "Look-out Mountain," for it commands a very extensive view both into the cañon and up the cañada, in the opposite direction; furthermore, it is most probable that when this country was inhabited it was used for that purpose, for the stone foundations of a building which formerly covered the summit are still distinctly visible. Close under this hill a very large spring gushes out of the ground, the waters of which more than double in size the Aravaypa stream. Without this large permanent supply of running water the cañon could probably never have been formed.

For the first two miles the walls are perpendicular on one side, and sloping on the other; the former do not exceed 500 feet in height; but at the end of that distance a large triangular mass juts up from the centre of the ravine, which seemed to us to bar all further progress. The stream, however, had

managed to twine around it, and by following in its bed we succeeded in doing so too.

From this point the walls on both sides are perpendicular. They are formed for the first few miles of conglomerate alone, which is horizontally stratified; in fact, drift-washed down by primeval waves from the mountain's side. But as the

Our First Camping Ground.

gradual fall of the stream bed, which is on an average 50 feet per mile, brought us deeper into the earth, we reached the sandstones, and gradually passed through them to the hard granite beneath.

Luxuriant vegetation fills up the space between the walls; the undergrowth consists of willows, young trees, bunch grass, reeds, &c., forming in many places an impenetrable thicket; and above them a succession of noble trees tower

up towards the sky, as if striving to gain a glimpse of the upper world. Under a grove of the loftiest cotton-woods and sycamores, at a distance of four miles from the head of the cañon, we threw down our blankets for the first night's rest. Not far distant, a few deserted Indian wigwams were visible, perched upon the top of the cliff, which painfully reminded us of danger. The setting sun beautifully illuminated three Norman watch-towers, which some freak of nature had carved out upon the precipice that rose above our grove of trees.

The obstacles our surveyors had to contend against naturally made our progress very slow, not more than from two and a half to three miles per day being cleared; for a path had to be cut through the brushwood which choked up the narrow passage, and every tree obstructing the vision of the levellers had to be felled. The Mexicans whom we had picked up were of great assistance to us. We hired six of their animals for pack mules, and several of the men to help as axe-men in cutting a path through the thickets. I obtained a mule for my photographic "outfit," and was thus enabled to take a number of views of the gorge. During the second day's advance we came to a cave, hollowed out in the northern wall, capable of concealing about fifty men, and opposite this we picked up several Indian skulls and human bones. To these relics there hangs a tale.

In 1863 a company of Californian volunteers on their way eastward to fight the "rebs," and glad enough to get a little professional practice *en route*, joined in an expedition headed by a Captain Tidball, the object of which was to break up the chief rancheria of the Aravaypa Apaches, which was located on this spot. The citizens and soldiers, guided by some tamed Apaches who were kept at Camp Grant,

entered, as we did, the head of the cañon, and came upon the Indian village just as the evening was changing to night. They hid quietly until daybreak, and then attacked the savages with such effect, that out of seventy, who formed the band, but twelve escaped; all the rest were massacred—the women and children by the tamed Apaches, the warriors by the Americans. The fate of this band was not undeserved, for it had been the terror of the country round for a long time previously, and had committed many frightful atrocities upon the helpless Mexican and American settlers. These Apaches had carried on agriculture to some extent in the cañon, for we passed the remains of a few small irrigating canals in places where the space between the walls left a sufficient extent of bottom-land for such a purpose.

As we advanced, the cañon became more and more tortuous. Bold walls of rock often enclosed us in front and rear, as well as on either side; nor could we tell which way to turn until we had come close upon the apparently insurmountable barrier. Higher and higher towered the walls. For the first few miles they were flat and continuous from base to summit, although portions here and there stood out like huge needles or lofty spires from the main cliffs; but after attaining a certain height, the walls became divided into two, the upper portion of which seemed to lean a little back and to rise from the lower one, like a cliff springing from a cliff. The walls, in fact, became two stories high, and each story measured about 400 feet. The strata of the upper story or cliff continued, as before, to consist of conglomerate; but grey sandstone appeared at the base of the lower one, and gradually extended upwards. Caves and grottoes became very numerous, and every mile added to the grandeur of the chasm.

The stream had to be crossed over and over again—often at every hundred yards; and it was curious to see how active the little axe-men of nature, the beavers, had been, for many a wetting was saved by our men on foot being able to cross over the large trees which, having been felled by these little fellows, had fallen athwart the stream. Nor were beavers the only inhabitants. Deer came down to drink at the brook, but by what paths remained a mystery to us; quails and doves were very abundant in places; and birds with beautiful plumage—some bright red, others rich blue, and a third variety, a black and white kingfisher with a bright red crest—especially attracted our notice.

I was photographing with a companion one afternoon in the cañon, about half a mile in the rear of the surveyors, when suddenly a succession of shots ahead made us start up from our work. The gloomy grandeur of such a place was not good for the nerves; and we feared terribly an Indian attack, where the advantages of position were so much against us. Leaving the camera, black tent, and the rest to take care of themselves, we hastened towards the front. A horse, minus his rider, dashed rapidly past, which did not increase our confidence. On arriving, however, at the scene of action, we were not a little relieved on finding that a fine flock of turkeys had so tempted the foremost of our party, that, forgetful of the alarm they would cause, they had seized their rifles and fired at them. The explosion caused by even a single shot in such a chasm sounded like the report of a dozen cannon, so great was the reverberation, and so many the echoes which followed it.

About seven and a half miles from the entrance, the cañon becomes so narrow that it appears only as a cleft between the huge perpendicular walls which tower above us: there is no

space whatever on either side between the bed of the stream and the rocks, so that the only passage is in the river itself. The action of the water, moreover, has hollowed out the base of the southern wall-rock for from 20 to 30 feet of its thickness, so that we rode under the rock itself for some distance.

The first "narrows," as we called this passage, having been passed, we came to an open space of some fifteen acres, giving us a good camping ground and plenty of grass for the stock. This space is situated about the centre of the cañon, and is very beautiful, being filled with splendid timber, cotton-wood, sycamore, live oak, ash, willow, walnut, and grotesque old mezquits of most unusual size. Fine branches of mistletoe hung from many of the trees; we met no girls, however, on this occasion, but the laughter-loving parasite was a great surprise.

Just past this open space a great change takes place. In order, it would almost seem, that the traveller should not weary of the cold grey sandstone and conglomerate formations, the sombre tints and horizontal strata, large quantities of volcanic rock, with their smooth facets and their rich tints varying from purple and red to black, burst into view, and alter completely the appearance of the walls. A deep rich fringe of basaltic columns adorns the terraces on either side, and this lavaform coating is bright and shining; the edges are as sharp in outline as if cut with a knife, and produce fantastic forms in the shape of turrets, &c., quite different in appearance from those met with previously. Nor is the change to be seen only in the rocks—the vegetation immediately shows the difference of soil; and, identical in position with the new strata, appeared for the first time on our route the *Cereus giganteus*, the largest cactus with which botanists are

acquainted. Here these huge grooved columns thrust their thick trunks from between the crags, and rise up on all sides far above our heads to heights varying from the baby-plant to the forty-feet. They seem to require no earth; and in places the walls are covered with them to the very summit. The secondary columns shoot out from the central stem, and then turn upwards with studied regularity, forming a circle of

The Cereus giganteus.

four or six arms around the parent trunk. Besides the "Monumental Cactus," as it is sometimes called, large bushes of prickly pear, tufts of Spanish bayonet and magay, with other species of prickly plants, also find a genial abode up amongst the crags, producing a contrast most singular and striking between the grotesque spinous vegetation upon the walls and the graceful foliage in the narrow passage beneath.

A little further, the rocks on either side approach so closely as to obliterate for a second time the entire passage, and this time the bed of the stream alone remains between the walls for two miles and a half of its course. At this part the walls present another break in their perpendicular height, and appear to consist of three terraces or cliffs piled one above the other, each capped with basaltic columns; thus showing, as it appears to me, the real nature of the terraced form. Each cliff or terrace is, in fact, a land-slip into the gorge, the lowest terrace representing the part earliest detached; for as each terrace is covered with lavaform basalt, it is evident that at some time each ledge so covered must have formed part of the surface of the ground over which the lava had flowed.

Between the two "narrows" the cañon did not widen much, so that the lengthening shadows overtook us very early in the evening, and obliged the surveyors to cease from their work; and when the sun had left the upper world, and night had really come, the blackness of darkness around us was absolutely awful, and the stars, which covered the narrow streak of sky above, seemed to change the heavens into a zigzag belt, every inch of which was radiant with diamonds. Our camps, too, were very picturesque. The mezquit tree, with its tortuous stems, grows to an unusual size here, and as the wood makes magnificent fuel, we found the foot of one of them to be the best place to pass the night. Dotted about amongst the trees the cheerful blaze of a dozen fires would light up the branches and foliage, making the darkness visible, and giving us a glimpse now and then of the massive walls which towered up above us. We discovered an amusement for our long evenings quite in harmony with the place.

Amongst the party of Mexicans there was a tame Navajo

THE ARAVAYPA CAÑON, SOUTHERN ARIZONA

Indian, who had been captured by his present master some years ago. This savage had many accomplishments, and, amongst others, he knew the war songs and dances of many of the neighbouring tribes. He was very fond of our camp, for he seldom went away empty-handed; and when the fires were blazing up and a good circle had been formed for him, he would come and sing his war songs until far into the night. A different dance accompanied each chant; the music was very wild and plaintive—a dreary dirge in a minor key—at particular parts it became very slow and piano, then a quick movement usually followed, the dance corresponding with the music, until the climax was reached by a series of yells which made the whole cañon re-echo with unearthly sounds. Our oft-repeated applause had the effect of exciting the little fellow to such an extent that he usually kept it up until he was quite exhausted.

So melancholy were the intonations of all these curious chants, that they seemed to be the fitting funeral march of a people speedily and for ever passing away from their place amongst the nations of the earth.

Three-fourths of the cañon was traversed and surveyed in four days; the remaining fourth, however, presented the most formidable obstructions; for large masses of wall-rock had fallen into the narrow cleft in so many places, that no sooner had we succeeded in getting our mules and horses over one pile of *débris* than a fresh one lay across our path. We gradually entered, however, a more broken and open country, and gaps in the walls became proportionately frequent. Confusion seemed here to reign supreme; no longer did the abrupt walls hem us in, but large masses of rock, I may say sides of mountains, lay piled up all around. We measured one perpendicular cliff, which, from its position, was acces-

sible to our instruments: found it to be 825 feet high, and this was below the average of the walls; so it is easy to conceive the relative magnitude of the rest. From out of this chaos the cañon gradually emerged, widening out and approaching more to the extent and appearance of a narrow valley. The south side first began to break away with sloping bluffs, covered with cactus and stunted vegetation, while the north side continued perpendicular for three miles and a half beyond the second "narrows," where it joined a huge mountain of igneous formation, consisting of six basaltic terraces one above the other, which formed a fine landmark for miles around to show the position of the cañon. Beyond this are foot-hills on both sides for two miles more, when the cañon merges into the widening valley, which, some six miles further on, joins that of the Rio San Pedro just south of Camp Grant. In this valley nearly all the water of the Aravaypa sinks into the earth. I hear, in fact, from residents at the fort, that for many weeks during the year no surface-water whatever enters the Rio San Pedro from it, although in the cañon there is always a fine stream.

An Indian trail, which is easily followed in single file, except where the bed of the stream alone is left, or where the whole path is blocked up with *débris*, leads quite through the gorge. In the first part of the cañon there are at least five lateral means of exit through arroyos which enter it, one on the southern and four on the northern side, but there is no escape whatever for the rest of the way.

Some of our men in advance came one day across an Indian encampment, in which the ashes of a fire were still smoking, but nowhere did we see an Indian. Their wigwams were of very frequent occurrence during the last eight or ten miles, especially in the valley between the cañon and Camp Grant.

They all consisted of a round framework of sticks, tied together with grass on the top, and lined within and without with willow, grass, and weeds; a little space being left for the entrance.

It was evident, then, that we had frightened the Apaches out of their natural haunts. They feared perhaps another massacre; or they looked upon our instruments, which seemed to take up so much of our attention, as some infernal machines, intended to destroy them, had they given us a chance.

Be this as it may, we were glad enough to come above-ground again; for, apart from the oppressive feeling caused by such a place under any circumstances, the actual fact was always present in our minds, that our enemy from above could, almost at any moment, have completely annihilated our whole party. Had the Indians thought proper to hurl rocks down upon us as we passed through many parts of the passage, from which there was no possible escape or hiding-place, not one of us could have escaped to tell the tale of this adventure.

On Wednesday, the 26th, I arrived at Camp Grant, and two days afterwards the whole party reached it safely. This

Nov. 26.

post consists, like all the others, of a collection of adobe houses and log-huts, with large covered verandahs to keep off the sun, for it is very hot here in the summer. The view from it over the country is a very peculiar one; for, although not a tree is to be seen on the hills which rise up on all sides, the *Cereus giganteus* takes their place. I have never seen it growing thickly, so as to hide a patch of ground from view, but everywhere these solitary pillars, with their encircling arms, are to be recognised, and as no other kind of vegetation is in the least conspicuous, they become the most prominent objects in the landscape.

The result of the survey from Railroad Pass to Camp Grant is the following:—

	Miles.	Feet above Tide-water.
Summit of Railroad Pass		4,411
Playa de los Pimas (centre of trough)	6·50	4,275
Head of Aravaypa Cañada	22·52	4,474
Eureka Spring	5·89	4,164
Head of Aravaypa Cañon	19·41	3,370
Leave high-walled cañon	14·49	2,645
Camp Grant	12·12	2,174
Total in miles	81·93	

The Rio San Pedro enters the Rio Gila 11·55 miles from Camp Grant, at an elevation of 1,911 feet above the sea.

The result of the survey from Railroad Pass, *viâ* Nugent's Pass up the San Pedro to Camp Grant (the route travelled by our wagons), is the following:—

	Miles.	Elevations.
Summit of Railroad Pass		4,411
Foot of slope west of Railroad Pass	5·8	4,206
,, east of Calitro Mountains	6·4	4,203
Summit of pass through Calitro Mountains	10·1	4,740
Mouth of cañon, Nugent's Pass	20·9	4,475
Surface-water of Rio San Pedro		3,390
,, ,,	41·3	2,662
,, ,, at Camp Grant	22·0	2,168
From Railroad Pass to Camp Grant *viâ* Nugent's Pass	106·5	

Average fall of the Rio San Pedro per mile 20·4 feet.

Colton and a small escort of cavalry came with me to Camp Grant. The second evening after our arrival the soldiers

Nov. 28. gave one of their fortnightly theatrical entertainments, which savoured much of nigger minstrelsy and burlesque Italian opera singing; and the next day after this pleasurable excitement, Colton and I bade good-bye to the officers and the one lady who were residing here, and directed our course southward.

After a few days' visit to Tucson, Colton returned to the ırveyors on the Rio Gila. I passed on to Mexico. It is, ıerefore, with great pleasure that I invite my readers to avel with my much-esteemed companion and friend to the acific, before they join me in my trip through Sonora.

CHAPTER VI.

THE VALLEY OF THE RIO GILA, AND COUNTRY LYING BETWEEN THE RIO COLORADO OF THE WEST AND THE PACIFIC OCEAN.

CONTRIBUTED BY CAPTAIN WILLIAM F. COLTON.

The Rio Gila and its Tributaries.—The Plateaux beyond the Valley.—Cultivation in the Gila Valley.—Insufficiency of Rain-fall.—Great Heat of the Summer.—Navigation on the Rio Colorado.—Valleys along that River.—Pacific Cordilleras, the Sierra Nevada and Coast Ranges united.—San Diego Bay.—The Town.—Climate of San Diego the finest in America.—Southern California.

THE Gila River, rising in the Mogollon ranges of New Mexico, has a general westerly course, passing into and traversing the entire breadth of Arizona, and emptying into the Rio Colorado just opposite the boundary between California and Lower California. From the north it has numerous affluents breaking through a region frequently mountainous and always much broken, but with beautiful and fertile valleys well supplied with timber and animal life, and remarkable for the evidences of an ancient civilisation found in the ruins of well-built towns and extensive acequias constructed of cut stone.

From the south it receives but few branches, the Rio San Pedro being the most important. Below the mouth of the San Pedro, the valley of the Gila for a distance of twelve miles is open, and varies from one to two miles in width. The river then "cañons," and for about thirty miles winds its devious way between frowning cliffs and precipices. From the lower end of these cañons to its mouth the valley is open

and wide, with a regular and gradual descent of from 8 to 15 feet per mile.

Ascending the bluffs which mark the limits of the valley proper, we come upon a vast desert plain, dotted here and there with isolated mountains rising abruptly from the general level, and presenting sharp, serrated outlines against the clear, rainless sky. Almost entirely destitute of water, this region is a very uninviting one to the explorer, and but little is known of it save that its mountains are wonderfully rich in precious metals.

The great mail road from Tucson runs in a north-westerly direction, striking the Gila River at Sacaton, a mail station. Thence it follows down the river to Maricopa Wells, where the stream makes a great bend to the north, and does not strike it again till it reaches Gila Bend Station, from which point the road continues down the valley to Arizona City—a very small place with a very big name.

The soil in the valley of the Gila in many places is so strongly alkaline as to be unfit for agriculture; still there is an immense breadth of land susceptible of successful cultivation. Maize, barley, wheat, cotton, and all the vegetables of the temperate zone are already profitably cultivated by the few white settlers between the cañon and Sacaton, and by the Pima and Maricopa Indians between Sacaton and Maricopa Wells. Below the latter station there is no cultivation except in small gardens at some of the mail stations on the lower river.

Not reckoning its tributary valleys, the Gila valley has about 300,000 acres of arable land, capable of sustaining an agricultural and mining population of 200,000, which is, no doubt, a low estimate. During the same season the same land produces two crops, one of wheat and another of maize.

The breadth of land now under cultivation—in many places subject to the frequent incursions of the terrible Apaches—is quite small. Intelligent residents gave me the following estimate for Southern Arizona:—

ARABLE CULTIVATABLE LAND.

	Acres.
Valley of the Aravaypa	5,000
,, ,, San Pedro	50,000
,, ,, Santa Cruz	20,000
,, ,, Gila	300,000
,, ,, Salt River	50,000
,, ,, Colorado	15,000
Total	440,000

UNDER CULTIVATION.

	Acres.
Tres Alamos and vicinity	500
Calabasas ,, ,,	200
Tubac ,, ,,	500
Tomacacori ,, ,,	50
San Xavier del Bac	100
Tucson	2,000
Above Pimas Reservation, on Gila	1,000
Pima Reservation	1,000
Total	5,350

MAIZE AND WHEAT RAISED IN 1867.

		lbs.
Tres Alamos		500,000
Calabasas		200,000
Tubac		500,000
Tomacacori		50,000
San Xavier		50,000
Tucson		1,500,000
Gila River, above Reservation		1,000,000
Indian Reservation	wheat 750,000	
	maize 250,000	
		1,000,000
Total		4,800,000

That part of Southern Arizona lying east of a line drawn from Baboquivari Peak to the Gila above Sacaton possesses, in common with New Mexico, great pastoral advan-

tages. It is covered at all times of the year with a magnificent growth of grama grass—one of the most nutritious grasses known to stock-raisers; and at no season of the year do cattle need other shelter than that afforded by natural variations in the surface of the ground.

Timber is scarce. In the Santa Catarina and Santa Rita Mountains pine is abundant, but elsewhere, and then only upon the immediate banks of the streams, cotton-wood and mezquit alone are found to supply either timber or fuel. The latter is a remarkably hard and durable leguminous wood, and grows in the Lower Gila valley and in the Colorado to a size large enough for cross-ties, and not unfrequently attains a diameter of from 18 to 30 inches. It makes the most highly-prized pianoforte legs.

On the plains in the immediate vicinity of the valleys and west of the line referred to, bunch or gieta grass is abundant, and furnishes, in addition to the valley grasses, excellent grazing. The Pima and Maricopa Indians, as also the white and Mexican settlers on the Upper Gila, have large herds of cattle. Farther west, grass becomes very scarce, and gives place to grease-wood, wild sage, artemisia, and the numerous family of cacti, of which the *Cereus giganteus* is the most worthy of notice. A story is current that an American in Central Arizona has been known to climb these terrible fruit trees, but there are few who are credulous enough to put any faith in it; hence the Far-Western phrase, "Up a cactus tree!"

The excessive dryness of the atmosphere during the greater portion of the year has made these otherwise fertile plains a barren waste. During the months of July and August a few showers cool the heated traveller, and give a temporary freshness to the vegetation; and during the month of December one or two heavy rains may be expected, which

raise the streams, and sometimes flood portions of the valleys. At such times the Gila River, at the Pima villages, is from 50 to 75 yards wide and about 10 feet deep, while near its mouth it attains a width of 150 yards, with a depth of about 12 feet.

The summers are intensely hot, and the winters extremely mild. At Fort Yuma snow is unknown, and the meteorological record at the hospital shows the maximum and minimum temperature to be 116° and 34° Fahr. At Arizona City, on the east bank of the Colorado, and just opposite the fort, the mercury has been known to reach 126° in the shade.

Southern Arizona is wonderfully rich in silver ores, and, in common with Central Arizona, has immense deposits of the sulphites, carbonates, and oxides of copper. Gold is also found in quartz lodes and placers.

The Colorado River is now navigated to Calville, 612 miles above its mouth, and about 400 miles south-west of Salt Lake City. The stream is very uncertain in its character, having numerous sand-bars, with a shifting channel, which in places separates into smaller ones, none of which are readily navigable; but the light-draught steamers used in navigating this river, on reaching a place of this character, proceed to the most favourable channel, and force the sandy bed of the pseudo-channel with poles. These steamers never run at night.

The Colorado Steam Navigation Company have three steamers and three barges on the river—the *Colorudo*, 70 tons; the *Cocopa*, 100 tons; and the *Mojave*, 70 tons; the barges, each, 100 tons; total, 540 tons. These vessels draw 1 foot light, and 2 feet when loaded. The trips are irregular, depending on the arrival of sailing vessels at the mouth of the river, where all freight is transferred to the barges.

Freight is carried at the following rates in coin :—

	Per measured Ton. Dollars.
San Francisco to Fort Yuma . . .	47·50
,, ,, La Paz	57·50
,, ,, Fort Mojave . . .	77·50

Lumber, from San Francisco to Fort Yuma, 60 dollars per 1,000 feet. Ore, as return freight, is carried from the Eureka Mines to San Francisco at 15 dollars per ton.

The valley of the Colorado is capable of sustaining a vast population. The large areas of arable land along the river are separated by cañons, and are known generally as Colorado Valley, Chemehuevis Valley, and Mojave Valley. Between these great valleys are many smaller ones, besides the vast tracts of land situated on either side of the river, below the mouth of the Gila. The bottoms are about four miles wide, subject nearly everywhere to overflow, and capable of raising the cereals, vegetables, cotton, and, I believe, below the Gila, sugar-cane. Vast quantities of cotton-wood, willow, and mezquit are found along the river banks and in the valleys. Cotton-wood and willow are used by the steamers for fuel, mezquit being rejected because of the rapidity with which it burns out the grates in the fire-boxes.

The following figures were taken from the meteorological record at Fort Yuma :—

	Inches.
Average fall of rain for 1857 . . .	0·33
,, ,, ,, 1858 . . .	8·57
,, ,, ,, 1866 . . .	4·20
,, ,, ,, 1867 . . .	2·94

At Arizona City is an excellent bridging point, the river being confined between rocky bluffs. Between these bluffs the river is but 472 feet wide, and from 12 to 37 feet deep, with a very rapid current.

Crossing the Rio Colorado here to Fort Yuma we find ourselves in the State of California, and but a short distance from the Mexican boundary. Perhaps a more uninviting point could not be selected at which to enter the far-famed State, whose name is synonymous with bullion. From the Rio Colorado to the Cordillera, or Great Range, stretches a weary desert, 100 miles in width. Traversing this desert, and crossing the Mexican boundary, is New River, whose waters (when it has any) run northward into vast shallow lakes. It is well known that a large part of the desert is below the level of high water in the Colorado, and as New River receives its water from the floods of the former, much of this land can be irrigated. Here the mirage is seen in great perfection, often deceiving the weary and thirsty traveller.

The eastern drainage of the Cordilleras is marked by rapidly-descending cañons, the waters from which find their way down the long slopes at the foot of the mountains to the desert, where they soon disappear in their dry sandy beds.

The foot-slopes of these mountains ascend from the desert by grades of from 50 to 150 feet per mile. Through these mountains are three passes, accessible for the Gila route, viz., Jacomba, Warner's, and San Gorgonia. The Jacomba, recommended by General W. S. Rosecranz, is the most southern, and almost on a direct line from Fort Yuma to San Diego. It would save about sixty miles over the route by Warner's Pass, but it is deemed impracticable for a railroad. Warner's Pass is practicable, but requires the maximum grade (116 feet) for several miles, with very heavy and expensive rock-work. San Gorgonia Pass is the best of the three, but too far to the northward to be used were San Diego to be the terminus. Considered with reference to the route by the 35th parallel, it would be its most direct outlet

to the nearest seaport—San Pedro. But if a trans-continental railway be built by the Gila route, it is highly probable that Warner's Pass would be selected.

Leaving the summit of Warner's Pass at the Felipe Ranche, we descend towards the Pacific coast through lovely valleys, in which large herds of cattle and horses graze throughout the year. Here, on vast estates held under Spanish titles, live the native Californians—wealthy in lands and cattle, unprogressive, and, until lately, much opposed to the American occupancy.

San Diego Bay has acquired great prominence in view of the construction of a southern railroad to the Pacific Ocean; but its few intelligent Americans are too sanguine of its early rise to grandeur and wealth. San Francisco, as the great commercial metropolis of the Pacific States, must be for a long time the great terminus of Pacific railways.

The Bay of San Diego is a perfect place of safety for vessels, and possesses an advantage over San Francisco Bay in that it is easy of access from the sea. Its entrance is protected from the strong westerly winds by a bold promontory, on which stands the lighthouse. It is not obstructed by a bar; it is but three-eighths of a mile wide, and never has less than five fathoms of water at low tide. In 1865, the steamer *Vanderbilt*, drawing 22½ feet, and loaded with coals, steamed into the bay, and discharged at the plaza. The bay has plenty of water, and good anchorage for vessels of the heaviest draught, and, if needed, could shelter the whole navy of the United States. The mean tides are 6½ feet, and the highest ever known, 12 feet. (See plan of harbour facing p. 134.)

San Diego, or "Old Town," as it is familiarly called, has a population of about five hundred souls, mostly natives, and lies at the northern end of the bay, just below the mouth

of the San Diego River, and, in consequence of the delta formed by the sands carried from the mountains by this stream, has no landing.

New Town, about two miles to the southward, with but three or four houses, has an excellent landing for coasting vessels; and to build wharves reaching into deep water would not be costly. The location of the town is excellent, the ground admirably adapted for building, and with ample room in the rear for a large city. There is great need, however, of good water, most of the water obtained in wells being slightly brackish; but a growing town could be easily supplied from a point on the San Diego River, about eighteen miles distant, where the water is perfectly pure and very abundant.

The business of the place is small. About 7,000 barrels of oil are annually produced from the Californian grey whale, which is caught along the coast, and towed to the shore to be "tried out." Some 2,000 head of cattle, a few horses, and a few hides find their way through the town from Lower California.

It has been asserted that the country at the back of San Diego is not capable of cultivation; but I cannot endorse this. I believe that, with the exception of part of the grain required for the sustenance of hundreds of thousands of population, the back country can produce everything needed, including a great excess of cattle and horses; for olives, oranges, limes, lemons, English walnuts, grapes, pomegranates, barley, wheat, and all the vegetables thrive well.

At the Old San Diego Mission, about six miles above the town, and on the river of the same name, are many thriving though aged olive and orange trees. I saw also at the Old Town two old date palms which were planted by the early

Jesuit missionaries. These trees give quite a tropical aspect to the scenery.

Besides its fine bay, the boast of San Diego is its climate, which for mildness and salubrity excels that of the most famous spots within our natural limits. By the meteorological record kept here when the place was a military station, the minimum temperature was 40°, and the maximum 82° Fahr. Frost and snow are of course unknown; and at all seasons of the year the mild, delightful sea-breeze sets in about ten o'clock in the morning. The death of a resident is looked upon as a remarkable event; and when I was introduced to the resident physician, his dilapidated appearance told plainly of a very small visiting list. "Why, sir," said he, leaning forward with his hands on his knees, and throwing an amount of earnestness into his dilated eyes which I cannot describe, "why, sir, a physician would starve to death if he depended on his practice for a living!"

I would here state that the San Diego River is every winter bringing down from the mountains a large quantity of sand, and depositing it in the bay just opposite its entrance, thereby gradually silting up that part of the harbour. This can be easily and cheaply remedied. Just north of the harbour is another basin—a false bay separated from it by a narrow flat; and it is proposed to direct the waters of the river into this hitherto useless basin.

Southern California, so far as it is yet known, and in the opinion of eminent geologists, is not rich in useful or precious minerals. Gold has been found in a few places, as also copper, but neither as yet pays for the labour bestowed upon it. Tin has been found near Temecula, but is believed to exist only in pockets.

Indications of coal were observed thirteen years ago on the

shore near San Diego by the Mormons, who sunk a shaft to a depth of 86½ feet. Veins of good coal were found, varying in thickness from 6 inches to 4½ feet, but during the next year Utah was invaded by the United States' troops, and Brigham Young ordered all the faithful to Salt Lake to defend the "Holy City." Thus the work was abandoned, and the shaft is now full of water. There seems to be no doubt that the coal can be used for commercial purposes.

From San Diego to Temecula, a distance of fifty-four and a half miles on the route to San Bernardino (at the western end of San Gorgonia Pass), the road bisects numerous streams and dividing ridges nearly at right angles, and presents an exceedingly rough profile; but from Temecula to San Bernardino—fifty-five miles—it traverses almost an unbroken plain. The streams crossed are, the San Diego, the Soledad, San Diegito, San Illejo, San Louis Rey, Temecula, San Jacinto, and Santa Anna. These streams are all full and strong, and most of them difficult to cross, by reason of quicksands; we were obliged to stop and lead our horses across them, for though the bottoms easily sustained the weight of man, they threatened to swamp the poor horses. Most of these valleys contain a great deal of arable and extremely fertile land, while on hills and in valleys the luxuriant grasses of California sustain immense herds of cattle and horses. Occasionally we would pass the "casas" of some wealthy ranchero, surrounded by orange groves and vineyards, and at several of them we were right hospitably entertained, and refreshed with the *vino del pais*.

From San Bernardino, which is a large and rapidly-increasing wine and fruit town, sixty miles brought us to Los Angelos, famed for its salubrious climate, its beautiful women, and its three thousand acres of vineyards, and twenty miles

more to the post of San Pedro, where Colonel Banning, the commander, dispenses his hospitality in a charming manner.

How we were entertained; how we tasted wines of various vintages; how we passed through San Fernando and Soledad Passes, to the Great Basin east of the mountains; how we skirted the eastern foot of the mountains to Tehachepa Pass; how General Palmer, with the parties from the 35th parallel, joined us there; how we exchanged our tales of adventure; how we traversed Tulare valley, where the wild flowers were in bloom and fragrant in December; how we clambered over the Coast Range at Pacheco Pass; how we passed through the beautiful valley of Santa Clara to San José; how we again rode behind a full-grown locomotive into San Francisco; how we all met safe and sound at last in the capacious hall of the Occidental Hotel; how heartily we commemorated that happy event; and how General Palmer, you, my dear Bell, and myself fared on our return trip by Salt Lake City, I must leave for others to relate.

CHAPTER VII.

SONORA.

Leave Camp Grant for the South.—Convalescent Camp.—Cañada del Oro.—Mezquit Forests.—Tucson.—Hunt for a Guide.—Van Alstine.—My Mule causes suspicion.—Routes into Sonora.—The Country.—The Papago Mission of St. Xavier del Bac.—Rio Santa Cruz.—Sopori Ranche.—A Girl carried off by the Apaches.—Mina Colorado.—Aravaca Valley and Enviguetta.—Obtain a fresh Mule.—Baboquivari Peak and the Zazabe Valley.—Papago Rancheria.—Hard travelling.—Lose our way.—Ranche on the Altar River.—The Midnight Massacre.—Robbers ahead.—Night travelling for safety.—Coffee.—Querobabi Ranche.—Tabique and its Inmates.—Change in Temperature and Vegetation.—Torreon amongst the Palms.—Opita Indian Girls.—Making Tortillas.—The Hacienda de la Labor.—Papagos in Petticoats.—A dangerous Wood.—Our Entrance into the Capital.

SITUATED a few miles to the west of the Sierra de Santa Catarina, in the valley of the Rio Santa Cruz, lies the Mexican

Nov. 29.

town of Tucson. This place of about one thousand inhabitants contests with Prescott, in Northern Arizona, the honour of being the chief town of the Territory. Sometimes Prescott is declared to be the capital, and the few officials who carry on the law business of the Territory, whatever that may be, assemble there; the next year, or the year after, it is changed to Tucson, and the *courts* are held there.

The districts around Tucson have the reputation of being very rich in minerals, and it was for the purpose of investigating this question that Colton left the party at Camp Grant. I accompanied him, partly because I wanted to visit the old Papago mission of St. Xavier del Bac, and partly because

I was anxious to gain information as to the best way to reach the Port of Guaymas in the Californian Gulf.

We were two days riding the fifty-four miles from *Camp* Grant, as it is called, to Tucson. The trail we followed, which is far shorter than that along the San Pedro, led us out of the valley of that river by a pass almost due west of the post. We then turned southward, keeping the grand granitic range, the Sierra de Santa Catarina, parallel to and near us on the west, whilst a broken, inhospitable waste stretched out before us to the north, west, and south, as far as the eye could reach. This was the commencement of the Sonora Desert.

About twenty-four miles from Camp Grant, we stopped at a convalescent camp, to which the soldiers who have been reduced by fever and ague in the San Pedro valley are sent to recruit. We found nearly half the garrison here under canvas, their tents perched on a rising ground, at the foot of which was the only spring upon this "jornada" of fifty-four miles. Camp Grant seems to be very unhealthy. It is curious that in an uninhabited country, a good supply of water anywhere is almost sure to be accompanied by those pests to all early colonists—fever and ague. The men quickly recover in this dry upland country to the west of the mountains.

On leaving the convalescent camp next morning, we kept for about nine miles along the summit of a ridge which bounds a deep gorge, the Cañada del Oro, lying between the road and the Catarina Mountains. In this gorge gold has been found in considerable quantities, and all the western drainage of the range collecting in it forms quite a torrent after rain. When we came within seven miles of Tucson, we rapidly descended into the valley of the Rio Santa Cruz, crossed the dry arroyo coming from the Cañada del Oro, and

entered a vast thicket of mezquit trees, through which our path led for the rest of the way. These mezquits cover many square miles in the Santa Cruz valley; they are mostly of small size, averaging 20 feet, but where the river comes to the surface—it is here mostly subterranean—they grow into fine trees. They afford excellent cover for the Apaches, who are constantly "lifting" the cattle belonging to the inhabitants of Tucson, and preventing agriculture from being carried on anywhere except in the immediate vicinity of the town. These trees would be most valuable if the country were only quit of the red-skins, for they yearly produce hundreds of tons of the most nutritious beans.

I visited a farm in the San Pedro valley before leaving Camp Grant; it was only four miles from the fort, and yet all the crops that autumn had been cut down and carried off before they were ripe by the Aravaypa Apaches, and all that remained of the stock was a few pigs. Half-a-dozen soldiers were kept at this ranche all the year round to try and protect it, so that the fort might be supplied with fresh farm produce; yet during three years this farm has changed hands thrice; the first man was killed, the second was scared away by the frequency of the attacks made upon him, the third is now thoroughly disgusted, and talks of settling amongst the Pimas on the Gila, a friend of his having converted seventy dollars into two thousand by raising hogs in the mezquit bottom-lands along that stream.

At Tucson I made all possible inquiries about the best way to reach Guaymas. My first idea was to go by boat from Fort Yuma, on the Rio Colorado, and down that river into the Gulf; but I learned that no regular line, either of steamers or sailing vessels, plied between these places, and that if water communication failed me, it would be impossible to go

by land, as I should have to traverse the whole length of the Sonora Desert. From Tucson the way by land was open, and I should be able not only to see the Port of Guaymas, and judge of its merits as a terminal depôt for a railway on the Californian Gulf, but should have an opportunity of traversing Sonora, and of discovering what that out-of-the-way country was good for, and what route would be most likely to prove the best for a branch railway from the trans-continental main line.

There was a celebrated guide at Tucson, whose services I hoped to have obtained; when, however, he heard my proposal, he plainly told me that the risk was too great, and that he had had so much good luck in his lifetime, that he was getting too old to tempt Providence any more. So I hunted about for somebody else, and had the good fortune to meet with a man named Van Alstine who had taken refuge in Sonora, knew the country well, and was quite willing, provided of course he got well paid, to conduct me as far as Hermosillo. I hope I do not malign the character of so good a companion and so excellent a guide when I confess that at my first introduction to Van Alstine he was hopelessly drunk, and that he knew very little about the agreement he had made until I routed him up next morning, and told him I was ready to start. He was a tall, wiry old Western man, of at least sixty, but hale and hearty; though his hair was grey and scanty, his brain was active and his senses keen; he was a great talker, and made, as we shall presently see, very good use of his tongue. During the civil war he had been arrested as a Southern sympathiser, and confined for nine months at Fort Yuma. This is one of the many "hottest places on the earth;" so hot was it the summer he was there, that my guide told me of two soldiers who, noted

for their evil deeds, had died when the thermometer stood at 120° in the shade. The next day they sent back in all haste for their blankets.

Our "outfit" consisted of the following:—Van Alstine, riding a miserable grey horse which had seen better days

Dec. 2.

and was now on his last legs, carried a pair of saddle-bags, a blanket, carbine, one six-shooter, a large tin mug, and a canteen. I carried my buffalo robe instead of a blanket, and had, I regret to say, one six-shooter extra; in other respects I was similarly equipped. My saddle-bags contained dry biscuits, a lump of raw bacon, coffee, and salt; also ammunition, tooth-brush, a flannel shirt, handkerchiefs, soap, and socks.

We had so far to travel, and so little time at our disposal, that I had exchanged my mare, Kitty, for a mule, before leaving Camp Grant. This mule belonged to Reed, the guide, and was one of the best specimens of these useful animals I have ever met with. He was as strong as a lion, and as plump as a partridge. He was very docile, well used to all kinds of hardships, and could keep up a fast walk, or "rack"—as the Americans call it—of five miles an hour from sunrise to sunset. On entering Tucson I became an object of suspicion directly because I rode this mule. Reed lives in the Mesilla valley, at the other side of New Mexico, but an old pal of his recognised the animal at once, and, eyeing me suspiciously, asked, "Is that ar your mule?" Smothering a slight feeling of resentment, I said it was; at which he replied, "Then I'm d——d if some chap han't been and stole it from my old chum, Joe Reed, though I haven't seen him these three years." He was disgusted when he heard that Joe Reed had really parted with his old beast of burden, and, giving me a slight wink by way

of apology, concluded by saying that, if I left the mule with him, "I was quite welcome to the difference."

The present boundary-line between the United States and Mexico has been well chosen, for it pretty nearly coincides with the southern rim of the Gila Basin. Highlands, covered with mountain ranges, are encountered all along the boundary from the Guadaloupe Mountains, which connect the Sierra Madre of Mexico with the Chiricahui Range of Arizona, to the Sonora Desert, and separate the head-waters of the streams flowing northward into the Gila from those running southward to the Gulf.

There are several routes by which Sonora may be entered from the north. There is a depression in the mountains to the west of Janos, through which a road, or mule trail, runs from the Casas Grandes valleys across the main divide into the basin of the Yaqui River. North-west of this route there is a trail, known as Cooke's Emigrant Road, which passes through the Guadaloupe Cañon, and leads to Fronteras and Santa Cruz. The same towns can be reached by following up the Rio San Pedro to its source, and the southern country can be penetrated by passing through the Cocospera Cañon, and joining the straight road from Tucson at Imures, on the San Ignacio River. From Tucson there are three routes by which Hermosillo, the capital of Sonora, may be reached. 1st. There is the straight road up the Rio Santa Cruz, across the boundary-line at Nogales, down the San Ignacio River to Magdalena, and thence due south to Hermosillo and Guaymas, a distance of 343 miles. 2nd. A road branches off to the westward at Canoa, thirty-four miles south of Tucson, and goes through Aravaca, across the mountains to the head of the Altar River, which it follows for some distance, then bears eastward again, and

meets the Magdalena Road at Santa Anna, a town a few miles south of that place. The third route goes still more to the westward. It leaves the second route at Aravaca, goes thence to Altar, and strikes the Magdalena Road a few miles north of Querobabi, a ranche eighty-five miles north of Hermosillo.*

The first of these routes is the shortest and best; but it is the most subject to attack from the wild Indians and robbers, whereas the other two, lying as they do in the Papago country, are much safer to travel by. These routes were very little known, whereas the first one had once been partly surveyed; this consideration finally decided us upon taking a course of our own, in order that we might become acquainted with the other two routes and their advantages for railroad purposes.

Sonora itself is a very mountainous country; from the Gulf coast it rises gradually to a central plateau, which is capped by mountains called generally the Sierra Madre. For at least one hundred miles to the west of the dividing ridge, range after range covers the whole country. Their altitude is not great, but they are very continuous and persistent; they are rugged and narrow, and lie almost invariably parallel to each other, except about the United States' boundary, where a transverse line of upheaval seems to have thrown the whole country there into confusion. The direction of the parallel ranges is mostly north-west by south-east, with a tendency in the centre of Sonora to run north and south. Along the narrow valleys between these ranges flow the little streams which rise either on the southern slopes of the northern watershed, or on the western sides of the Sierra Madre; and hard work have they to break through this succession of ranges. At last, however, when the zigzag

* These routes are given, with tables of distances, in the Appendix.

passages have been traversed from one parallel trough into another, and the more open strip of country lying between the mountains and the coast has at length been reached, the thirsty soil usually swallows up so many of the little streams that only two of the rivers of Sonora ever succeed in reaching the sea, namely, the Yaqui and the Mayo; all the others fail to cross the great Sonora Desert.

After this short glance at the country and the routes, we will start from Tucson, and follow the Santa Cruz River for nine miles to St. Xavier del Bac. This place is the most interesting relic of priestly government to be found in the entire region which was once Northern Mexico. Here stands a large church, cruciform in shape, with a dome over the intersection of nave and transept. The western front is lavishly ornamented with plaster saints, filigree work, and pillars, and is surmounted by two towers, one only of which is finished. All round, skirting the roof, is a parapet of small pillars, and above this are other ornaments, which help to screen the roof. On entering the church, the roof causes the greatest astonishment. It is formed of seven dome-shaped compartments—three for the nave, one for the chancel, two for each transept, and one over the central space. Each of these is ribbed or fluted from a central point, and the entire roof is made of small red bricks. The whole church is built of red brick: even the little pillars which adorn the tops of the walls are all made of bricks, which were moulded to the shapes required before they were baked. The altar is a very fair one, and above it is an elaborate combination of black gilt pillars and saints placed in niches. The centre figure is that of a priest, simply dressed in black, with a three-cornered hat. This, no doubt, is St. Xavier del Bac, a saint about whose great piety I am, I regret to say, grossly

ignorant. Most of the ornamentation appeared to be only of stucco, yet the gilding was very rich, and has well resisted the wear and tear of time. Whilst I was examining the interior, several Papagos came in to pray; they performed their devotions mostly aloud, and one woman, after praying for some time, began to sing. She made a most horrid noise, something between an Indian war-song and a Gregorian chant, which "moved me too much," so I went away.

This church would be considered a fine one in Switzerland or Germany, yet not a single priest lives here now, and only an occasional service is performed by one of the resident clergy from Tucson. Grouped around it are the conical thatched huts of the Papagos, who seem to have taken shelter under the shadow of the great giant rising from their midst. Not a creature lives here except these Indians. There is not, besides the church, any building larger than a hut. I wondered, as I looked at this strange sight, whether it might not have fairly represented a Saxon village in the twelfth century—a number of huts clustered around a fine massive Norman church—and whether our ancestors then were much more civilised than these Papagos of the present day. As the Saxons proved, in the race of centuries, stronger than their conquerors, will these Papagos also in time regain their ascendency over us? They are not Red Indians; they do not belong to that debauched and degraded stock which melts away before the breath of the white man. They are of the South—Aztecs, or native Mexicans, as you like—but semi-civilised people, not savages. Already they have risen superior to the Spanish element, and have proved themselves better men than the mixed blood—the Mexican. It is, therefore, worth while to wait and watch the meeting of the waters, the mingling of streams never before brought

together—the Anglo-Saxon and the semi-civilised native American.

How well these Indians must have worked under the Spanish missionaries to have built such a church! I have seen no other building made of furnace-baked bricks in the country; all this they must have learned. Then there was the building of the roof of brick arches, the moulding of the ornaments for the towers and decorations, and a thousand other arts necessary for the successful completion of such an undertaking. I really know not which to admire most, the adaptability of the Papagos or the zeal of the priests.

Leaving St. Xavier del Bac, we kept to the road along the valley, occasionally passing an uninhabited ranche, until, after travelling eighteen miles from the church, we found that an American had lately taken possession of a ruined house called "Roade's Ranche;" and here we got a shakedown for the night.

One word about the Rio Santa Cruz, the eccentric course of which can be traced at a glance on the map. For the first 150 miles from its source it is a perennial stream; but four miles south of Roade's Ranche, at a spot called Canoa, it usually sinks below the surface; it then flows underground almost to St. Xavier (twenty miles), and again reappears at a spot called Punta de Aqua. The Papagos are thus supplied with water, and are enabled to raise what crops they require around their huts by means of irrigation. Beyond St. Xavier it usually again sinks, rising for a third time as a fine body of water near Tucson, enriching a broad piece of valley for about ten miles around that town, turning the wheel of a fair-sized flour mill, and then sinking for ever in the desert to the north-west. During some seasons it flows further than others, so that the length of stream above ground is

subject to considerable variation; but it never succeeds in reaching the Rio Gila on the surface, although I believe it flows over the bed-rock and under the drift which covers it for the remaining one hundred miles from Tucson to the Maricopa Wells, where a large spring—the waters of the Rio Santa Cruz, as is believed—comes to the surface and flows into the Gila. Wherever water can be obtained, the valley is exceedingly fertile, and might, under cultivation, be made very productive. South of Tucson, fine pasturage clothes the high lands on either side.

Four miles from Roade's Ranche, on the following morning, we left the valley and the main road, and, on reaching Canoa,

Dec. 3. bore to the westward along a tributary stream until we reached, about mid-day, the next inhabited ranche, called "Sopori," distant eleven miles from our last halting-place.

This ranche was built on a rock, and still further strengthened against attack by a wall of stones, which completely surrounded it. On climbing up the rock, and getting over the other defences, we found in the house five girls and one little boy. The girls were all grown up, ranging in age from seventeen to about twenty-five. They met us as if we were rare curiosities, and invited us to partake of their meal. Poor people! it was bad enough, for it consisted of sun-dried Mexican mutton fried in grease, and very badly-made tortillas.* They told us that they were a family of Southerners; "and as we uns could not live with you Yanks, father thought it best to clear out in time." The father and eldest brother were out in the Santa Cruz Mountains, cutting pine for the miners there; but as they had seen nothing of them for three

* Flat cakes made of dough without yeast.

weeks, they began to "hope that the Indians had not got them."

The girls chatted away with that perfect ease which strikes a stranger so much, even in the humblest of the people, provided they are Americans bred and born. This emigrant family got on very well at first, their flocks and herds multiplied, and the well-watered strip of land around their house produced abundantly. But the Apaches found them out, and drove off the stock again and again; they killed two of their brothers, and frightened their mother to death when their last little boy was born. "But," said the youngest girl, "they haven't been here now for two years, so we are expecting them every month." This girl then told me of her experience in Indian warfare.

About the time of the last visit from the Apaches, she and a little Mexican girl were on their way to meet their fathers at the mines up in the mountains, accompanied by some peons, when they suddenly fell into an ambuscade. The Mexican peons fled for their lives, leaving the two girls in the hands of the Apaches, who placed them on ponies and carried them off across the mountains. At first they were kindly treated; but in the meantime the peons had given the alarm, and the father, with all the miners working with him, started off in pursuit. When the Apaches found themselves hard pressed, they stripped the girl (who was then fifteen years old) of everything, even her shoes, knocked her senseless with a blow on the head from a tomahawk, speared her in several places, and, after shooting some arrows into her, left her for dead. She rolled off the footpath down the bank, and was thus hidden from sight when her father and his party passed by, but a few feet from her. As far as she could make out, it was forty-eight hours before she recovered

consciousness. Then she found herself covered with blood and pierced with arrows, three through her arms and one through her leg. She broke off the heads and drew them out, and then tried to crawl up the bank and regain the footpath. She had no water, no food, no one to help her; and yet thirty miles separated her from the mine, which was the nearest point where she could quench her burning thirst.

It is almost impossible to conceive any position so terrible. The idea of a young girl, perfectly naked, wounded in this manner, and dying of thirst and exhaustion, finding her way back over thirty miles of stony path, across mountains, to a place of safety, is almost too incredible for a sensation novel; and yet this girl did manage to creep, by slow stages, over the entire distance, and, in six days of inexpressible suffering, appeared in a state of high delirium before her father. She told me this in the presence of her sisters; and they were honest, homely people, who would not, I am confident, say what was untrue. I saw the scars of three arrow-wounds on her arms, and can well believe her when she says that on her body there are several other scars to bear witness while she lives of that terrible journey. Some time afterwards, the Mexican child was retaken and given back to her parents.

Van Alstine and I bade our fair hostesses adieu, thanked them for their hospitality and their chat, and wished that they might never see any more of their enemies, the red-skins. As we rode along, we talked for many a mile about these five daughters, all alone in the Sopori Ranche. They had plenty of fire-arms, and knew well how to use them behind their stone barricades. But what a life of anxiety and watching is theirs! and what joy it must be to them when their father and brother come home safe from the mountains!

Eleven miles more brought us to the Colorado or Heintzel-

man Mine. One or two hundred Mexicans still live here in huts which were built by the proprietors of the mine for their peons when they established their works; systematic mining has, however, for some years been discontinued, although the yield exceeded 200,000 dollars in silver. The inhabitants now live by the pickings, and by extracting silver from the ore in the roughest possible manner. We inspected the square formed by the adobe houses of the Gambosenos,* and my guide tried to get a few eggs, and some corn for our animals; but failing in both, and not liking the looks of the people, we continued on our way for four miles further. It was then dark, and finding good grazing ground, we picketed out our horse and mule, and went to sleep. We remained so long at Sopori Ranche that this day's travel was only twenty-six miles.

A four miles' ride before breakfast brought us across a little dividing ridge into another valley watered by a stream called the Aravaca. Here are the deserted furnaces

Dec. 4.

of the Colorado Mine; and a row of telegraph poles along the hills uniting the places shows very clearly that extravagance must have had something to do with the downfall of this mining enterprise. The Aravaca valley runs east and west, and a very rugged range of mountains bars the direct course southward on the opposite side. So we turned to the eastward, intending to cross these mountains by the trail which strikes the head of the Altar River. On this trail, nine miles from Aravaca, is to be found Enviguetta—another relic of mining enterprise—where a fine steam engine and a mill of, I believe, twenty stamps, with well-built houses for superintendent, employés, &c., now stand idle. One man takes care of this place; and he did us a very good turn.

* Poor Mexican miners, who mine each on his own account, and club together for mutual protection.

Van Alstine's old charger had by this time broken down completely. He could, in fact, go no further; but we spied a very fat and docile-looking mule disporting himself near the mill. Now, amongst the gentlemen of Tucson who were most ready to assist me on my trip, and who gave me introductions which I found most useful, none was more kind than Dr. Lord. Not only had Dr. Lord all the practice of the place, but he seemed to have monopolised most of the business also; and so active a mind found no difficulty in combining the professions of general merchant and physician with great ease and profit. He was also superintendent of this defunct mining company, and owned the mule of which we stood so much in need. I therefore persuaded his servant to lend us the mule for the trip, to be returned by Van Alstine some time within the space of three months. It has not been, and probably never will be, my good fortune to thank the doctor personally for the use of his valuable quadruped—we should probably never have reached Guaymas without it—so I hope that, as books nowadays travel even further than those who write them, this expression of the deep obligation I am under to him will some day reach him, even at Tucson.

The account given us of the country ahead by the man in charge of the mill led us to change our course. The trail leading to the head of the Altar River crossed a divide quite impassable for any railroad, but we heard from him that through the wide valley which lay to the east of the Baboquivari Peak, an almost level pass led into Sonora, and that a trail to Altar went that way. This route was generally, I may say, impracticable for travellers, from scarcity of water; but, as luck would have it, we had heavy showers three days in succession, so we concluded to take this latter route, at all

events far enough to examine the pass at the southern end of the valley before mentioned, which I shall in future call by a local Indian name—the Zazabe valley.

A ride of twelve miles next morning (almost due west from Enviguetta) brought us in sight of the Baboquivari Peak. From some foot-hills on the east we looked westward across a valley (Zazabe valley), about twenty-five miles broad, and thrice that distance in length. Straight in front of us, on the opposite side, rose a range of bare rocky mountains of exquisite outline, and surmounted by that grand peak which formed so good a landmark for triangulation during the Mexican boundary survey—the Baboquivari Peak. The peak itself looks like one huge needle rock, thrust up vertically for a thousand feet above the highest mountain summit of the range. The valley seemed to be a wide, grass-covered trough between two parallel mountain ranges, and in its centre there was a depression, the only indication of drainage visible on the surface. Bearing to the southward, we followed down the valley on the eastern slope until evening, having a range of mountains always near us on our left, when we made a dry camp and halted for the night. This day's journey was about thirty miles.

A five miles' ride before breakfast next morning brought us to the end of the valley and to the commencement of the pass. Here the former had lessened in width from twenty-five miles to a passage of scarcely half a mile, which rose very gradually between the foot-hills of the ranges on each side, and led across the divide out of the Gila Basin. A short distance up a side arroyo in that narrow part we found the Zazabe spring, where we watered our mules and breakfasted. After a ride of eleven miles further we struck a Papago trail leading from Fresnal and

Dec. 5.

Tecoloti, Indian villages west of the Baboquivari Peak, to the valley of the Altar River, and although the country looked anything but inviting, the direction suited us, and we determined to follow it.

About thirty miles of terribly rough, inhospitable country lay between the open plains we were just leaving and the Altar River; and so difficult was it to find the way through the endless hills and dales, crags and dry water-courses, here encountered, that two American prospectors a year and a half ago lost their way and nearly perished in trying to cross it in the opposite direction. After travelling some seven miles we came to a spring known as Ojo de Santa Lucia, where we watered our mules, and on starting afresh, found ourselves suddenly in the midst of an Indian rancheria. Huts appeared all around us, and in considerable alarm I cocked my carbine, and certainly expected that we were in for a fight. I had quite forgotten the Papagos, in whose lands we were travelling. These were their huts, so there was nothing to fear. Between twenty and thirty temporary huts represented a large party of Indians, who were making one of their periodical journeys into Sonora from their own villages in Arizona, to trade with the Mexicans; and we perceived, from the pony and cattle tracks, that they had much stock with them.

Twenty miles further, we entered a district at the foot of a lofty conical hill, called Sombraritto, from its resemblance to a hat, where a great number of gold quartz veins crop out on all sides, and where native miners are wont to wash for gold at certain seasons when the gullies contain water. Here the little indistinct paths were so numerous that we lost our way, and got entangled in the cañons and arroyos which cut the country into a thousand segments.

Of course I had a compass, and we first tried to steer by it; our mules responded well to the spurs, and we kept them jogging along and climbing up and down the most terrible places. However, the country got worse, and by sunset this mode of solving the difficulty was proved a failure. Van Alstine then determined to keep to one arroyo, and follow it, if possible, down to the Altar River.

On we went, hour after hour, winding about at the bottom of the gully, now pushing through thick brushwood, then climbing over masses of rock, sometimes in the darkness knocking our heads against overhanging branches; for, as the moon was obscured by clouds, the mules alone were able to see. About ten o'clock we almost tumbled up to the animals' necks, without knowing it, into a wide stream, which proved to be the Altar River. We found a road on the other side, and, four miles further, a ranche, where we pulled up. I passed a capital night coiled up in my buffalo robe at the bottom of a cart in the yard, but a worse fifty miles I never passed over than those which formed our fourth day's march.

Dec. 6. One day's rest was absolutely necessary to the mules, so next morning we did not go further than six miles, where was another ranche at which we could obtain accommodation, and something to eat besides dried mutton and tortillas. Here we passed the next twenty-four hours, and here occurred a tragedy which is, I think, worth relating.

This ranche was a good representative of its class. It was built of adobe on a rising ground overlooking the narrow little valley of the Altar River, and was to all intents and purposes a fortification. Four walls about 12 feet high, without windows, enclosed it in the form of a square; and at three of the angles three watch-towers—also built of adobe—

with loopholes, formed the defences. A large gateway opened through the house into the yard, leading to the stables, sheds, and pigsties, all of which were enclosed in the wall. On entering the gateway, a door led to the right and left into two large rooms; one was the storehouse and barn, the other the general sleeping apartment, common to all the inmates. Of course, no beds, or other luxuries which ordinarily denote a bed-room, were visible, but an old-fashioned oaken press and a well-swept floor sufficiently suggested the fact to any one accustomed to rustic Mexican life. Cooking and household duties generally were carried on in the outhouses, which were built against the high wall all around the yard.

After walking the mules through the house to their sheds, and giving them plenty of corn (maize) and corn-stalks, we watched with pleasure the decapitation of a fowl and other preparations made by our good hostess for the coming meal. How good was that fowl, and the poached eggs which followed it! When bedtime arrived our little party had increased to a tolerably good roomful, considering that we had all to take possession of different parts of the floor. There were of the household the mother, the aunt, the father, three little boys, and the baby, two farm-servants, and the maid-of-all-work. We all packed into the room, Mexican fashion; and, laying down my buffalo robe as close to the doorway as possible, with my head on my saddle, and my fire-arms by my side, I was soon oblivious.

When the lords of creation had made themselves comfortable, in crept the feathered fowl. A fine old cock and his wives perched on the shelf just over my head, and a lot of little chickens secreted themselves behind the press before mentioned. These were soon asleep. At midnight, however, the enemy came. I was suddenly aroused from my sweetest

slumbers by feeling my face most unmercifully scratched; the air was filled with the flutter of birds and the screaming of domestic fowl. I seized both pistols and stared hopelessly into the darkness; up started the maid-of-all-work, and one or two more, who tumbled over others in their attempts to escape, and thus completed the general confusion. At last a match was struck, and lo! nothing could be seen but a brood of terrified chickens. There was a cause for their alarm, and this cause we found behind the press.

When the human beings and the fowls had fallen to sleep, a pretty-looking little quadruped thought that this bed-room would be a very nice place for him also. He looks like a cross between a fox and a ferret, and carries a fine bushy tail; his body is striped with black and white, and he rejoices in the name of Skunk. Half-a-dozen chickens had already fallen a prey to his teeth and claws, and he was enjoying the flavour of their heads so much that no amount of probing up with divers long poles would make him stir from his hiding-place behind the press, so we sent a bullet through his head. He had his revenge, but he kept it to the last; for the stench which instantly followed that shot baffles description. After much good training I thought I could have slept through anything, or in the company of any one, but I had never before tried a skunk. I went away, and, as it was raining, took refuge with my docile mule. The most wonderful part of this little incident still remains to be told: the Mexicans, after grumbling a little about being disturbed, went back to their blankets, and slept it out until morning without more ado. Thus ended the adventure of the chickens, the skunk, and the midnight massacre.

With replenished saddle-bags and rested animals we started

afresh after a good breakfast, directing our course for a couple of miles further down the Altar valley, and then branching off to the southward on a trail leading to Santa Anna, across another rough belt of country lying between the Altar and San Ignacio streams.

Dec. 7.

We passed on the way two more collections of Papago huts, made but a few days back to shelter the same party from the heavy showers which had lately fallen. Not once had we met any one on the road since entering Sonora, and we were congratulating ourselves upon nearing an inhabited region, and having safely escaped all dangers from Indians, when a Mexican gentleman and his servant came in view. Seeing that we were travellers, he stopped and had an animated conversation with Van Alstine, the purport of which was, that some miles further on the road we intended to take he had been attacked by robbers, and but for the bold front shown by himself and his servant, they would most certainly have been robbed, if not murdered. Both were well armed, and they kept the brigands at bay by holding their loaded rifles steadily to their shoulders as they passed rapidly on.

This gentleman also stated that, a few days previously, an obnoxious justice of the peace had been robbed and murdered on the road, that the people were afraid to pass from one village to another, and that this lawless state of affairs extended down to the outskirts of Hermosillo. This news was not pleasant for us.

After riding twenty miles we came to some stagnant water, where we gave our mules a drink and filled up our canteens. A little further we entered a timbered country, covered chiefly with mezquit, and here we rested until night arrived, when we saddled up and continued our journey. The moon rose about ten o'clock, and gave rather too much light for peaceful

travellers in so dangerous a country. In a few hours we came within five miles of the San Ignacio River, upon which stream there are numerous settlements. Here we halted and slept out the remainder of the night, having completed about forty miles since starting in the morning.

Just as we were making a fresh start a suspicious-looking ruffian rode up to us, and wanted to know where we were going. We told him we were going all over the country, and showed him how beautifully six cartridges were packed away in the butt of our carbines, after which he took himself off.

Dec. 8.

Van Alstine had a friend at Santa Anna, a young Mexican dandy, who thought no small beer of himself. He had been to Europe and the States, and had made a good deal of money as a miller in his native village since his return. He spoke English fluently, and gave us some really good coffee for breakfast, after which we went on our way. At the little town of Santa Anna we struck the high road from Magdalena, the largest settlement on the San Ignacio River, and followed it for the rest of the way to Hermosillo. At Barajitta, a small mining village twelve miles from Santa Anna, I obtained a fine specimen of gold quartz. About twenty-six miles further we came to some tanks close to the point where a trail from Alameda joins the main road, and as we had made nearly forty miles since morning, we concluded to halt; so, after watering our mules, filling our canteens and tin cans, and going a couple of miles away from the water-tanks for safety, we again took refuge in the woods, lighted a little fire, and cooked our evening meal.

What would the traveller do without coffee? Of all things it is the most necessary; it matters little what you have to eat, provided it fills the vacant place within, for all

the comfort comes from the coffee. It matters not how bad the water is, for plenty of coffee puts it all right. Cold, wet, and weary, our tin mug of black steaming coffee proved the best of night-cap, and a quart a day (that is, a pint to each meal) we found to be only just sufficient for one person. When you must work hard and brave all weathers, even the pipe must yield at last to coffee.

Two ranches only fill up the long distance of eighty miles between the San Ignacio and San Miguel rivers, and as we wished to avoid notice as much as possible, and to prevent any of the Mexican idlers who prowl about these places from laying any plans to waylay and rob us, we purposely travelled in a very eccentric manner, sometimes by day, sometimes by night, and never stopped long at any of these places. Thus we reached Querobabi early in the morning, made a hasty meal, gave our mules some corn—the real object of our visit—and started on again.

Dec. 9.

Querobabi is a large ruined stock-farm, where once some great Spanish stock raiser lived in barbaric state, owned vast flocks and herds which roamed all over this fine pasture country, and kept a large number of rancheros, peons, and retainers at his establishment. Such places are found all over the country, either quite deserted and in ruins, or partly inhabited, though stripped of all their former greatness. At this place I found five men of the Papago tribe standing at the entrance; they wore clean white cotton mantles thrown over their shoulders in the Spanish fashion—leggings, moccasins, and broad straw sombreros. As I stood by them I felt a dwarf, and on measuring them I found that the average height of the five was 6 feet 3 inches. There are, probably, few races of greater stature than the Papagos. Their skin was almost black.

The present occupiers of Querobabi seemed to have nothing about them to cause suspicion. They took advantage of the presence of a doctor to hold a long consultation with me, and the gift of a small box of pills placed us on excellent terms. But the next ranche, Tabique, had a bad name. Its owners had joined the Imperialist party, and lost their all in defence of Maximilian; and it was rumoured that since their return from temporary exile, they were in the habit of *harbouring* brigands, even if they did not go so far as to join them in their marauding excursions. This place was thirty-six miles distant, and could not be avoided, because the only water to be found on the road for a much greater distance was that contained in the tank belonging to this ranche; it was enclosed by a wall and thick hedge, which passed around it from the ends of the building at the back.

As there was no help for it, we jogged up to the entrance gateway on our tired mules just after sunset; looking, I imagine, as poor a pair of travellers as often passed through this deserted country; and a curious lot of people we found inside. All around the central enclosure different families of peons were gathered together under the tumble-down sheds or outhouses which had been built against the lofty outer wall. They were cooking their meals around the different fires, the lights from which flickered up between the legs and arms of the naked children, and half disclosed the features of the women, whose swarthy complexions and piercing black eyes peeped out from beneath the large shawls and robosos which covered them. The old mansion had been burned down in the late war, and blackened ruins appeared here and there, adding greatly to the general desolation.

Lounging at the gate, or occupying the few benches which the place afforded, were the male portion of the community.

Here we had a score or more of the most complete specimens of the stage brigand. A black matted beard, and a huge sombrero drawn well over the eyes, effectually hid their faces; they wore mantles thrown across their shoulders, long boots reaching far above the knee, with huge silver spurs; the fringes of their leather breeches hung over their boots; and knives and revolvers were but half concealed beneath their mantles. Van Alstine was, as usual, quite master of the occasion; he had a hearty word for the men, and chatted so much with the women, that it seemed as if he had never in his life been in such agreeable company. We watered and fed our mules, and succeeded in disposing of supper, after talking enough had been gone through to drive me almost wild; for, alas! I was unable to join, and could not conceive how they could find so much to talk about. The men, having also supped and inspected us thoroughly, smoked a cigaritta and gradually dispersed. When the place was pretty quiet, and the gates were being secured for the night, we saddled up and took our leave. This was a master-stroke of policy, and very probably saved us from attack; and as it is safer to kill foreigners than to allow them, when plundered, to escape —for much more fuss is made about them than the luckless natives—we had good cause for mutual congratulations.

Twenty miles further, we rode through the thick forest which had been reported so dangerous by the traveller we had met the day before, and then halted, as usual, in the bush, to give ourselves and mules a little rest, having travelled fifty-seven miles since starting the morning before. We had camped just at the outskirts of the mezquit forest, and, as it proved next morning, on the edge of the dry, streamless plateau. A range of mountains bounded us, all through the day and night, on our left, and appeared to be a continuation of the

range which lies to the east of Magdalena and the upper portion of the San Ignacio River.

Next morning we had scarcely started when we perceived a gap in this range a little to the southward, and as the sun

Dec. 10.

rose we looked down upon a silver thread emerging from it; and soon a lovely rich green valley, studded with palm trees, settlements, and orange groves, came into view at our feet. We had reached the valley of the San Miguel River, and a ride of three miles brought us by a rapid descent to the picturesque little village of Torreon.

From the moment we crossed the divide out of the Gila Basin, near the boundary-line, we had been descending at the rate of at least 1,000 feet in every fifty miles; and as at the same time we were travelling due south, the change in climate was very considerable. I was heavily clad at starting; but the days were now too hot to wear a coat with any degree of pleasure, and we usually took ours off, preferring to ride in our shirt sleeves. And here, at last, we had reached the region where the date palm, the banana, plantain, and other hardy palms are to be found. The first view of palm trees growing naturally in the open country is a very beautiful one; and this valley, dotted with groups of these trees, coming so unexpectedly in view, seemed like part of another world. The cactus plants upon the plateau are wonders of their family, and probably present more varieties and larger species in Northern Sonora than in any other part of the globe.* These

* It is probably no exaggeration to say that one-tenth of all the known species of cactus are to be found about the boundary-line of Mexico. Dr. George Engelmann, whom I met at St. Louis, describes one hundred species in his paper on the Cactaceæ of the Mexican Boundary Survey. Since the date of this paper, 1856, many more species have been added to the catalogue of this region by Engelmann, Parry, and others. The seventy-two exquisite plates

were accompanied by large thick-stemmed mezquit trees, each carrying a fortune in pianoforte legs, and many hard prickly shrubs, whose tiny leaves and beautiful flowers were just opening to enjoy the spring; but the contrast between the crabbed, drought-stunted foliage of the plateau, and the graceful verdure in the San Miguel valley, was great indeed.

At Torreon every little adobe building looks like a summer-house placed in a garden. Palms shade it from the sun; high hedges of prickly pear—*Nopala Castiliana*, as the Mexicans call it—keep out the pigs and the cattle; and groves of large orange trees, golden with fruit, lead down to the river at the back. We chose the prettiest of these baby-houses, and tapped at the cane door. Two girls, neatly dressed in prints and white aprons, came to let us in. They had only just reached womanhood, and were very good-looking; but their cast of features was quite new to me. Their faces were oval, almost round; eyes large, soft, and very round, of a dark blue colour. Their complexion was rich olive, but not as dark as that of the Mexicans generally. Their hair was jet black, neatly dressed; their voices were soft; and they laughed merrily when Van Alstine asked them if they would take compassion on two such queer-looking foreigners. My companion knew at once that they were pure-blooded Opita Indians.

This was my introduction to the most courteous race

with which the paper referred to is illustrated are lasting monuments to the liberality of the American Government for the advancement of science.

The following number of species were named as definitely determined:—

Genera.	Species.
Mammillaria	23
Echinocactus	17
Cereus	24
Opuntia	28
	92

The remainder were considered doubtful.

of Indians on the North American continent. The early Spaniards speak of them in glowing terms. In a previous chapter Father Marco's testimony is mentioned; but the strongest tribute paid to them by the Spaniards is that of naming the State, Sonora. The Opita country extends from the Rio San Miguel eastward to the Sierra Madre. It is a fine country, and the people are a brave and manly race. They were greatly delighted with the beauty of the first Spanish lady who visited them; and as they could not give the Spanish twang to the ñ, and wished to address her in her native tongue, they called her "Sonora," and the Spaniards, out of compliment to them, gave that name to the State.

It seems to be the fashion amongst many travellers to extol the beauty of savage races; to paint glowing pictures of young Indian squaws, and almost to rave about Hottentot Venuses. I have seen some fine races of Indians, and men, as well as women, of perfect symmetry; but beauty I consider quite out of the question. The faces of all I met, who had passed their childhood, were completely devoid of any single expression which could call forth other feelings than those of curiosity or disgust, until I encountered the Opitas of Sonora.

The Mexicans generally are gifted with a very small share of good looks; chiefly, no doubt, because the Indian element has overpowered and often destroyed the fine features of the Spaniard. But the settlements along the two rivers which unite at Hermosillo, and form the Rio Sonora, have been famed during two centuries for the beauty of their women, and this reputation I fully endorse; indeed, the mixture of Spanish with Opita blood could not fail to produce such a result. As I passed along the streets of Hermosillo, and watched the women assembling for matins, or returning from some religious festival, their chief occupation, I recognised in

most of the pretty women—and these were not a few—the round, oval face and the large, soft, dark blue eyes of the Opita as distinctly as if I had known their great grandmothers. I must not forget, however, that we have stopped at the threshold of the little ranche at Torreon, and that I have much more to tell about the Opitas hereafter.

Our mules just managed to squeeze through the door into the house, and out to the back-yard, where they got a famous breakfast. The girls set to work, and gave us large bowls of pap-corn and milk, followed by eggs, fowls nicely cooked, coffee, and hot tortillas. Van Alstine was more talkative than ever. Unfortunately for myself, I could not tell them that I was the bachelor of the party; and, in fact, I found the position very trying, particularly whilst the tortillas were being made.

Now if there is one feminine occupation more graceful than all others; if there is one which shows in the highest perfection the delicate hand and the rounded arm, and suggests, by an easy movement of the chest and body, the curves and outline of figure we love to admire in their perfection, it is the manufacture of tortillas. A lump of dough, which has been carefully prepared from Indian corn, finely ground, is placed between the palms of the hands, and whilst the arms are raised a little, a whirling motion is given to the dough, until, by gentle pressure most delicately applied, it is flattened out into a disc about a foot in diameter, and as thin as a wafer. It is then skilfully jerked upon a flat dish, and lightly baked. I would far rather see them made than eat them; for they are very much like my idea of underdone chamois leather.

When we had finished eating, the old father took us into the orange grove, and filled our pockets with magnificent

oranges and limes. He showed us his stock of corn, his fields, and his poultry; and after a rest of about three hours, he insisted upon saddling our mules himself, and would only receive payment for the fruit. Thus refreshed at the outskirts of the settlements—for the country we had passed through was practically uninhabited—we crossed the river, and proceeded on our way to Hermosillo through avenues of large cotton-wood trees, past several settlements and some fine haciendas. The hacienda of Labor looks like a large country-house, reminding you, however, of Spain and the Alhambra by its horse-shoe arches and Moorish arcades. Leading up to it is a broad avenue, lined on each side with the square-shaped huts of the peons, made of canes, lightly thatched and shaded by the trees above. Here humming-birds were fluttering over the flowers near the house.

All around, and for some distance above the river, every acre appeared to be under cultivation. The banks were clothed on both sides, to the water's edge, with plantations of sugar-cane; beyond these, some thousands of acres of cotton had just ceased to bear the feathery pods; and further back, again, were fields of maize, wheat, and beans.

On the outskirts of this and several other settlements passed on the way we met some of our old friends, the Papago Indians. They had built very neat conical huts, thatched with care, and seemed to be doing a prosperous trade with the Mexicans.

Now, I remember very well in England, before I ever thought of coming to this out-of-the-way part of the globe, that some near relations of mine used to meet other girls of their acquaintance, given like themselves to good works, for the purpose of holding Dorcas meetings and making clothes to cover the poor heathen. I long tried in vain to discover

what garments were considered by my fair acquaintances to be most appropriate, and what heathens were to be the fortunate recipients of their gifts. At last, in an unguarded moment, the secret came out—they were red flannel petticoats for the North American Indians. In my ignorance I laughed at the novelty of the idea; I even made fun of it, regardless of their wounded feelings. But of the existence of Papagos I was then entirely ignorant, so that great was my wonder and delight when I made the discovery that the most highly-prized garments worn by the squaws were red flannel petticoats. There they were, without a doubt; almost every woman wore one. Their breasts were bare, and no stockings covered their legs, but *the garment of garments*, so modest and unobtrusive, could not be overlooked.

All the water of the river being absorbed by the Hacienda de la Labor, eight miles of dusty road have to be traversed before any more cultivation is seen, and then another large farm is passed—the Hacienda del Alamita—owned by Signor Inigo, and containing several thousand acres of irrigated land. A wood, nine miles long, lies between this place and the capital —Hermosillo; and when we arrived at the entrance to it, we found three poor labourers and a woman, each armed with a bayonet only, waiting for an escort of some sort through the wood. All day long they had been wanting to return to their own village, but so unsafe was it to pass through the wood that they feared to proceed alone. Our three revolvers and two repeating rifles gave them confidence, and they trotted close behind us all the way. We passed a mule which had been killed the day before in a skirmish, and the vultures were anxiously waiting on all sides for the dainty meal to putrefy. At another place, where an arroyo crossed the road, one of the men pointed to some large rocks, and said, "There has been

much mourning caused here;" but good fortune favoured us to the end of our journey, and we were stopped by no one.

The long distances we had travelled day after day, and especially the extra night-work, had nearly finished off our mules. This last ride made mine stone-lame, and Van Alstine's could scarcely hobble along. In this condition, late in the afternoon of a dry, dusty, sultry day, bereft of coats, wearied and travel-stained, with our tin mugs and other traps dangling behind us, we entered Hermosillo. We passed some Mexican dandies taking their evening ride on showy horses with gaudy trappings, and followed by their armed servants; then, being painfully alive to our wretched appearance, and not wishing to meet any of our future friends, we entered a side alley and gained our hotel by a circuitous route, where we soon indulged, with infinite relish after our weary ride, in a good tub and a hearty supper.

CHAPTER VIII.

HERMOSILLO.

Peculiarity of its Situation.—A Marble Mound.—The Town.—Architecture of the Houses.—The Gardens.—Ruinous.—The City taken and retaken several times during the War.—Assault by the Liberals.—Rescued by the Opita Indians.—Mexican Politics.—Governor Pesquera.—"Volunteering."—Rumours of War.—All Fire-arms demanded.—Inequality of the Sexes.—The Indians of Sonora.—Population.—The four Northern States compared.—Annexation.—Any Change must be for the better.

Hermosillo is a most curious and interesting old town. In the first place, its situation is peculiar. For 2° of latitude our route had been on the eastern side of a vast plain, not far from the base of the mountains. On the western side of this plain lies another range, too distant to be seen from Santa Anna, but gradually encroaching upon the plain until it joins the eastern range a little below Hermosillo. The San Miguel River emerges from the eastern range just above Torreon, and, having joined the Rio Sonora, cuts through the western range at Hermosillo. In the very gap through which the river passes the city is built. In the centre of this gap, and rising high above the houses all around it, is a curious natural mound composed of variegated marbles, chiefly white and pink, which stands out boldly against the sky. It is called by the Mexicans "Bell Rock," on account of the metallic sound given out by the strata when struck.

One would suppose, from the size of the place, that it contained about 15,000 inhabitants; but as every third

house proves, on inspection, to be uninhabited, 9,000 is probably more nearly the population. A large Moorish town in Spain of about the seventeenth century was probably not unlike what Hermosillo is at the present day. Many of the houses are very large, and cover several acres. They are built of adobe, one story high, with very solid walls, and contain large, lofty rooms. Outside they are ornamented more or less with paint and stucco. No windows are usually to be seen; if a few do face the street they are guarded with strong iron bars, and differ in shape from our ordinary windows in being narrower at the top than below. They represent, in fact, that shaped cornice which the Moors introduced from Egypt into Spain, and the Spaniards into Mexico; and thus it has travelled more than half around the world. An archway in the centre of the block leads through huge oaken doors to the sahaun, or hall, with large rooms on either side, and a court, or patio, in front. The court is surrounded with a deep verandah, forming "the corradoa," supported all round by a massive Moorish arcade, and ornamented with birdcages, statuary, creeping plants, flowers, and palms, with a fountain in the centre of the patio. Doors open upon the corradoa from the different rooms, none of which are set apart exclusively for sleeping; for during most of the year temporary cane cots are placed in the corradoa at bedtime, and removed every morning. Facing the sahaun, or entrance-hall, on the opposite side of the patio, is usually another archway, through which a vista, cool and refreshing, is obtained of the garden. Every house of any pretensions has a garden at the back. It is usually small, shut in by very high walls on all sides, and filled with tropical and semi-tropical plants, orange trees, banana palms, poison olive, fruit-bearing cacti, and flowering creepers; it is also ornamented

with little bowers and summer-houses, in which tame birds chirp and twitter.

Numerous irrigating canals run through the city, and send off branches to the different mansions; and although in years gone by the wealthy families must have lived in great luxury, it was the luxury of an age very picturesque, but long passed away in Europe. There are two plazas, several churches, a large mint—the only modern building in the town—a fine park ornamented with four large gates of Moorish design, and a burial-ground full of interesting monuments. But everything is going to rack and ruin. Civil war and family feuds have left their marks on all; even in the late war the city was taken and retaken several times, and the property of each party was alternately plundered by the opposite faction. When Hermosillo was first taken by the Imperialist party, some cannon had just been forged at the mint by means of native coal obtained at the Bronces Mine on the Upper Yaqui. These field-pieces, four in number, were exhibited at the Paris Exhibition. The city remained in the hands of the Imperialists until the spring previous to my visit, when two thousand so-called Liberals appeared before the place early in the morning of the 5th of May.

A hard fight took place between the little garrison and the assailants; no quarter was given, and all the defenders were at last overpowered and slain. Then the rabble crew commenced robbing and plundering all through the town. Not an inhabitant was to be seen in the streets; every shop was closed except those which had been broken open, and were being sacked by the rabble. By eleven o'clock in the forenoon the Liberals had laden themselves with spoil, feasted and drunk until many of them were placed hopelessly *hors de combat* from liquor, when, suddenly, the cry came from the

east that five hundred Opita Indians, under their brave chief Tonera, were already within sight of the town. This tribe, accustomed to take an active part in politics, had long adopted the Spanish or Mexican mode of life, and when Maximilian was made emperor, they joined his party, and fought to the last in defence of the Imperialists. Out rushed the Liberals from the cellars, the larders, the storehouses, and the mansions they had been rifling, weighed down with plunder, and half drunk with mescal spirit. They ran through the streets, and met their foe upon the rugged side of the mountains, in full view of the citizens, each party hoping to gain there a commanding position for attack or defence. The Indians came on fiercely, though steadily, divided into two columns, taking advantage of every rock, or tree, or undulation of the rugged ground, and pouring volley after volley of well-aimed arrows against the two thousand men, who, huddled together without organisation, could not withstand the attack. The tide was soon turned, and back again rushed the Liberals, for a third time, through the streets, throwing away their ill-gotten booty in their flight, and closely followed by the exultant Indians, who, with shouts and yellings, speared and drove them from every nook and alley where they had taken temporary shelter.

By sunset quiet again reigned over the town. The Opitas had been completely victorious. They did not kill the wounded, nor plunder the houses and shops; they brought confidence to the inhabitants, and soon the town was thronged with men and women in holiday attire who came out from their hiding-places into the streets, feeling safe and secure under the protection of the Indians.

Dr. Duroin, the resident American physician, assured me that not an act of violence was perpetrated to his know-

ledge, and not an article of value was stolen by them from any one. When the Imperialist cause was entirely lost, the Opitas returned to their own lands, and left the turn of events to take its course.

The present state of Sonora is almost as deplorable as can be conceived. Before the war, a number of powerful families contended amongst each other for the spoils of office. In a territory so remote, whatever faction gained the State governorship obtained almost absolute power to crush and ruin those who had opposed them.

The people—humble, indolent, and averse, above all things, to the hardships and dangers of war—were made by force to fight the battles of their masters. Ground down to the dust, these peons are still in the most abject state of almost feudal bondage; their rights are unrecognised, they are never mentioned except as slaves, they can vote only as their masters direct, and they dare hardly call their lives their own. Before the war Pesquera's party had for some years been all-powerful, and he had been governor during three successive terms of two years. During the Imperial ascendency he fled to the States, and there became a shrewder and more far-seeing statesman; so that on his return he had no difficulty in regaining his power and greatly strengthening his position. He banished his enemies as Imperialists, pardoned those whom he thought might serve his interests, and snapped his fingers at Juarez or any other man who should attempt to interfere with him in Sonora. One-third of the leading families are still in exile.

A feeble remonstrance was made, by the representatives chosen by universal suffrage, about his extravagance. Whereupon he met his ministers, and told them that he also thought the expenditure too great, and therefore should

commence retrenchment by dispensing for the future with their assistance, and thus saving the salaries of a number of useless functionaries. The port of Guaymas is one of the chief sources of revenue. The customs duties levied at the Mexican ports along the Pacific coast average 100 per cent. on all manufactured goods, and the moneys thus received belong exclusively to the Central Government. This, however, was never allowed by the Governor of Sonora, who always kept the money, and by lessening the duties from 100 to 60 per cent., induced many merchantmen bound for Mazatlan to enter Guaymas instead, so that it has become customary for a vessel to wait outside these ports until a good bargain has been struck relative to the amount of duty to be paid on the cargo.

A few months before my arrival, President Juarez thought he would stop the misappropriation of his lawful revenue, and sent one of his own men, Signor Almuda, as collector of customs at Guaymas. Pesquera said nothing, but when 30,000 or 40,000 dollars had been collected, he suddenly appeared with a small troop of soldiers and demanded it; on being refused, out went Almuda from office, and another man was placed in his stead. The money was taken, and Almuda, finding resistance hopeless, returned after three days to his former position as collector of customs, but this time as servant of Pesquera, not of President Juarez. This little transaction occurred but three weeks before I met the Governor at Hermosillo, when, fearing that his extremely independent action might be interfered with, he thought it necessary to increase the State army. This was done by spreading the report of a Yaqui war. These Indians, it was noised abroad, had rebelled; "the whole Yaqui country was in an uproar!" "all travel was stopped!" "the Mexicans were being brutally massacred!" "to arms! to arms!!"

These were the cries. I was on my way to the Yaqui country, to examine the coal-fields there, and these reports effectually stopped my progress southward by land.

This is the way volunteering was carried on at Hermosillo. In the evening the military band usually played either in the plaza or opposite some gentleman's house. One evening, whilst listening to it from a window, and watching the men and women going to and fro, I suddenly perceived that soldiers had taken possession of all the approaches leading to the band, and were encircling the crowd on all sides. They seized all the young men who were present, and carried them off to the Government coralle, where they passed the night, and where next morning they had either to pay a fine if they possessed any money, or to *volunteer* if they did not.

Then there came a proclamation that fire-arms were required, and that five dollars would be given for any weapon that would shoot; but if this proclamation failed, and the police had to come and fetch them, no money would be paid. Thus the unfortunate people were stripped of their arms, while robbers infested the country, and Apaches made raids upon them, almost to the gates of Hermosillo. How crest-fallen and dejected these volunteers looked as they marched through the streets, armed with old flint-locks, broadswords, or any other weapon they could obtain! Their pay was a mere farce, for after years of service they would, on dismissal, receive a draft for the sums due to them, to be cashed when the treasury had been replenished—which meant, never. As this kidnapping of young men for the army has been going on year after year, it has produced so great an inequality of sexes amongst the Mexican population that in Hermosillo there are seven females for every one male.

The Yaqui war was of course a myth. These industrious labourers at first took flight, not knowing what to make of it; but after a time, as nothing dreadful happened to them, they returned to their usual occupation.

A few words are due to the Indians of this State, for they have the reputation of being the quietest and most frugal in the whole of Mexico. The Yaquis are the hewers of wood and drawers of water; their homes are in the South, but they are to be found everywhere. In appearance they are not unlike the Papagos; but are not so well off—judging by those whom I met doing most of the labour at Hermosillo and elsewhere. They are of a rich copper colour, with long black hair and rather large noses; they go about almost naked, with only a small piece of linen about their loins; they are very active and trustworthy, and obey every order they receive from the Mexicans in the most subservient way. A Mexican sigñoretta will not even take a parcel home from the shop where she has just bought it, but the first Yaqui that passes will run off with it without a word. I have seen this a hundred times. It is considered degrading to intermarry with the Yaquis.

The next tribe are the Opitas, of whom I have said enough; they will not work for hire, and stand on perfect equality with the Mexican population—excepting of course the chief families, which are the curse of this unfortunate country.

Lastly, there are the Papagos, who hold themselves quite apart, have their own Government, and do not mix in politics, and only come in contact with the Mexicans for purposes of trade.

Besides these three semi-civilised tribes—the Aztecs of Sonora—there are a few wild Indians along the coast, but these are dying out like their brethren further north, and have already ceased to be troublesome.

None of the Apache hordes who have succeeded in depopulating Northern Sonora live in that State; their country lies quite to the northward, in United States' territory.

With regard to population, Colton places Sonora in his new map of Mexico at 147,133 souls, which is simply absurd. A Mexican estimate, formed by adding up the population of each town, and then allowing a fair approximation for the rest, places it at 85,664, in 1845. An American estimate, founded on the Mexican one, considers 100,000 to be very near the truth for 1861. But this authority includes 20,000 Papago Indians, whereas there are certainly not more than 3,000 south of the boundary-line. This reduces the estimate to 83,000. Since 1861, both Mexicans and Indians have been decreasing; the mines have been more and more deserted, and yet the population in the towns has not increased; on the contrary, they also have been losing in numbers. Hermosillo, in 1840, contained 11,655 Mexicans, and 2,000 Yaqui Indians; in 1843, about 14,000, all told; and to-day the population is generally placed at 9,000 Mexicans, and 1,500 Yaquis. As I before remarked, every third house was unoccupied, and more or less in ruins. I might add, also, a long list of frontier settlements, none of which contain any inhabitants; and, in fact, I think that at the present time only 70,000 souls can be allowed to Sonora, including the Indian population.

Comparing this with the neighbouring States, we have:—

	Population.	Area. Square Miles.
Sonora	70,000	11,953
Chihuahua	164,000	15,534
Durango	156,519	6,291
Sinaloa	160,000	3,825

Sinaloa is the most populous, and its port, Mazatlan, is the most thriving town on the Pacific coast of Mexico. Chihuahua

has of late been fast declining in wealth, if not in population; but not to the same extent as Sonora, because she has had far less to contend against, both as regards hostile Indians and civil wars. It is easy, therefore, to understand how it is that the old Santa Fé trade has almost ceased to exist; and until a great change takes place in these productive provinces of Northern Mexico, there is little chance that commerce will again return to its ancient channels, and that there will be any permanent market for merchandise.

As things cannot be worse than they are, many think that they see in this utter state of prostration and national degradation the germs of a better future. Any change, they say, must be for the better, and they look to the prosperous States beyond the frontier to take Sonora and her sisters under their protection, and, so to speak, to give them a chance. I did not expect to hear this sentiment so freely and openly expressed by the Mexicans themselves; much as they were suffering, I supposed, until I came into their country, that the great jealousy they were considered to feel towards foreigners would make such an ultimatum decidedly unpopular, but I soon found reason to alter this opinion. They seemed to me to look upon annexation to the United States as their destiny, and one to be hoped for with as little delay as possible.

In speaking as I have done of the present Governor, I do not complain of him as a man. On the contrary, I consider him far above the average of Mexican governors, and I feel convinced that, as unity amongst the Mexican States is already merely fictitious, he will be willing to favour annexation, provided he thereby secures solid advantages for himself. That section of the governing class which now forms the party of power, would, no doubt, follow the same course; but

those opposed to him, although believing in the ultimate fate of the State, would disparage a union at the present time, simply because they could not themselves claim compensation. Thus there will probably always be, until annexation becomes an established fact, a strong party opposed to it from selfish motives alone, and that party will always consist of the future aspirants to office. National unity has already been destroyed, and the few patriots whom I have met are only too anxious to swear allegiance to a real republic, instead of a sham, and to renounce for ever that system of despotism and tyranny, that degradation of the many for the aggrandisement of the few, that corruption in office and disregard to law, which now disgrace one of the finest regions on the globe.

CHAPTER IX.

THE GULF OF CALIFORNIA.

From Hermosillo to Guaymas.—The Harbour.—The Town.—Trade.—Leave Sonora.—Carmen Island.—Salt Basin.—Oysters and our Oyster-man.—Pearls and a Pearl Merchant.—La Paz.—Mazatlan.—The Market.—Shopping in Mexico.—The Army.—The Harbour.—Lower California.—Arrive at San Francisco.

After remaining nearly a fortnight at Hermosillo, and making several excursions about the neighbourhood, I started on Thursday, the 19th of December, in a coach drawn by six horses—four abreast and two leaders—for Guaymas, eighty-four miles distant.

We travelled due south over a plain between two mountain ranges, which is usually a parched and arid desert, but which looked anything but a desert after the recent rains. About eighteen miles from my destination, I heard the gun fire for the steamer's departure, and had the pleasure of contemplating another month's involuntary sojourn amongst the people of Sonora. But my usual good luck in this trip stood to me to the last; for, to the surprise of all, the vessel was still in the harbour when we arrived, and did not sail until the next morning.

The true harbour of Guaymas covers an area of a little less than four square miles, in which space three small islands, the rocky peaks of sub-marine hills, rise perpendicularly from a depth of from three to four fathoms, and form a little inner harbour. From the bare volcanic mountains which enclose

the harbour, several irregular little promontories project into the water and occupy much valuable space. The total area, in fact, of water more than four fathoms in depth does not exceed one-half a square mile. The entrance is not quite a mile wide, and is guarded by a long rock island, called Pajaros, lying exactly in front of and outside it, which makes the harbour doubly secure. The main channel runs to the left of the rock. On entering, its course is at first north-east as it passes the rock, and then north-west as it enters the harbour. To the right, another passage leads to a larger, though shallower, basin, into which a small river discharges its *débris*. The depth of the channel is five fathoms until the rock islands within the harbour are reached, when it 's reduced to four and three. Three fathoms can be obtained in the centre of the inner harbour between the rock islands and the town; but it is only close to the former that four fathoms can be found.

The accompanying diagram of the three harbours, San Francisco, San Diego, and Guaymas, all drawn to the same scale, shows at a glance the relative capacity of each. There is no question as to the value of San Diego harbour. It is admirably sheltered, will admit vessels drawing 22½ feet of water, is at least four times as large as Guaymas, and is, next to San Francisco, the best harbour on the coast of California. It is, moreover, almost 300 miles nearer to New York than San Francisco, either by the Omaha line or that of the 35th parallel, and can be easily reached from the latter trunk line by a branch 211 miles long, which would traverse the most fertile portion of Southern California.

The results I arrived at from my reconnoissance through Sonora to Guaymas do not confirm the glowing accounts which have been circulated relative to the harbour of the

BAY OF SAN FRANCISCO

SAN DIEGO

GUAYMAS

Scale of English Miles

0 10 20

Three Fathom Line

latter. It is too small ever to become a commodious first-class port; its situation is bad, for it is too far up the Gulf of California (being 1,500 miles from San Francisco and 1,000 from San Diego), whilst a railroad to it from the North would leave the richest portion of Sonora untouched. As regards distance, supposing that the main Southern line were constructed along the 32nd parallel, and a branch thence by the shortest practicable route to Guaymas, it would then be 2,812 miles distant from New York, against 2,935 between New York and San Francisco by the 35th parallel route, the difference being but 123 miles in favour of Guaymas. Sonora, therefore, must be developed independently by local railways radiating from the coast inland to those sections of country which, on their own merits, are deserving of them.

The present trade of Guaymas is such that the three merchantmen which unloaded there during 1867 supplied more goods than the demand required. In Hermosillo, as well as Guaymas, all the store-houses of the merchants were glutted with goods, and the general complaint was that there were no buyers. Large quantities of Sonora wheat and flour used to be shipped from this port to San Francisco, San Pedro, Mazatlan, and other places along the coast. Now, none goes anywhere, except to the last-named port, and not very much there, since the monthly steamer has been prohibited from carrying it. Mazatlan has at least six times the trade of Guaymas, because the back country is well peopled, whereas Northern Sonora is almost uninhabited.

Comfortably packed away on board the *John L. Stevens*, one of the fine Pacific steamers, which, with their roomy berths upon deck and good ventilation, are palaces of comfort compared with our boasted "Cunarders," we steamed between

the rock islands in the harbour, and through the narrow channel into the clear, calm Gulf of California.

On the third day from our departure, we stopped at Carmen Island, close to the opposite shore (the coast of the Lower Californian peninsula), to take on board a cargo of salt and oysters. We were immediately surrounded by lighters, full of Yaqui Indians who labour on the Salt Lake, and I went ashore in one of them.

Carmen Island is worth a visit. It was purchased from President Juarez, during the Mexican war, by an American land company, which also bought nearly the whole peninsula at a great bargain, as it was when sold more than probable that Maximilian would have gained the day. Of this huge estate, the island we had just reached is the richest prize. Close to the shore, but partitioned off from the sea by a narrow strip of shingly beach over which the water never flows, is a lake covering an area of about six square miles, the bottom of which is composed of pure white crystals of salt—chloride of sodium—without any admixture or adulteration in the shape of sand, algæ, or other salts. Usually no water covers this area, and the salt has only to be raked up, packed in large sacks, and shipped to San Francisco. Here it is ground and sold, without any purification, as the finest table salt. Holes have been dug ten feet deep through pure crystals of salt. How much deeper they extend I could not ascertain, for the Indians only scrape as much from the surface as they require for exportation. Fine volcanic mountains form a semicircle around this lake; and when it rains, the drainage from them flows into the basin and covers the entire surface to the depth of a few inches. When I visited this spot it was covered with water; I tried to cross it, but the salt crystals were too sharp for my bare feet. As soon

as the water dries off again, all holes or irregularities of surface caused by the removal of the salt become refilled with crystals and obliterated.

It was the opinion of the American resident superintendent that this vast accumulation of salt was washed down by the rains from the mountains, in which he supposed that large quantities of disintegrated rock-salt were to be found. For, even supposing that this was originally an estuary of the Gulf, it is hard to account by that theory for the apparently inexhaustible supply, and for the fresh accumulations which still continue to form, although the sea has long since ceased to enter the basin. The purity of the salt, the absence of sand, and the great depth of the deposition cannot certainly be accounted for by the laws which regulate ordinary salt basins.

Seated beside me at dinner on the second day of my life on board ship, I found a very tall and gentlemanly Southerner. He had all the external refinement of a man who had mixed during a long life in the best European society, and had looked upon a princely fortune as a matter of course. The civil war had ruined him, as it had thousands like him; and here he was now, at the age of seventy, carrying oysters from Carmen Island to sell at San Francisco.

The San Francisco oysters very much resemble our natives. They are round, fat, plump, full-flavoured, and very good, but do not suit the taste of those who have long enjoyed the luxury of the large delicate molluscs which inhabit the Atlantic seaboard. There are fine beds of the long-shelled oyster in the Gulf of California; and as they will not grow in the Pacific Ocean, my Southern friend found that it paid him well to transport them 1,700 miles by steamer, and sell them on landing at six shillings a dozen, provided that not more than half the cargo had died on the passage.

Unfortunately for us, this special cargo got too much sunning before being deposited in the tanks. Many consequently died, as we quickly discovered by the most disgusting smell which took possession of the greater part of the ship. It took many days to pick out the corpses, and in the meantime I caught a fever; and notwithstanding the luxury of a bridal chamber for a cabin, a four-post spring-bed, and other comforts, arrived more dead than alive at San Francisco.

From Carmen Island we went to La Paz, a beautiful little town which nestles amongst palm trees at the extremity of an inlet, surrounded by those bold mountains of variegated volcanic rock so common along the coast of Lower California.* This is the only town on the peninsula.

Outside this bay many Yaqui Indians were diving for pearls, and, as may be imagined, we had a rich aquatic treat, watching the finest divers in the world as they brought up shells from eight fathoms of water. I need scarcely remark that these are not oyster-shells, but large flat bivalves of quite another family. The best pearls are contained in the body of the mollusc, unattached to the shell, and a common way of extracting them is to throw thousands of these soft lumps

* Until 1867, the physical geography of this peninsula was quite unknown, but in this year Mr. J. Ross Browne, accompanied by Mr. William M. Gabb of the Geological Survey of California, Dr. Von Lohr of the School of Mines, Freiburg, and a corps of assistants, made a scientific reconnoisance throughout its whole length. A full account of their researches will be found in Mr. Ross Browne's Official Report on the Mineral Resources of the United States for 1868, p. 630. A correct map of the peninsula was for the first time compiled from the results obtained by this party, and from it Mr. Ravenstein has drawn, on a reduced scale, that portion of the general map attached to this book. The slice of the peninsula which now belongs to an American land company has been represented; it comprises nearly the whole of Lower California, exclusive of the La Paz district.

Magdalena Bay was found to be a magnificent harbour, but fresh water was scarce, and the land arid, from deficient rain-fall.

The article referred to is a valuable contribution to our geographical knowledge, and well worth reading.

of flesh into a barrel, and allow them to decompose. The pearls, if there be any, are found at the bottom.

A pearl merchant, Mr. Peterson, here joined us, and after we had become well acquainted he showed me, in strict privacy, his autumn store. He was an old Norwegian sea captain on half-pay, and took very good care that none but those he could thoroughly trust should even suspect the nature of his precious cargo. The pearls were of all sizes, colours, and degrees of delicacy. The dark, metallic variety —which to my taste is so beautiful—was, if anything, the most abundant; many of the white ones were very large, and some Mr. Peterson had succeeded in matching to perfection for earrings, by which means the value of each pair was greatly enhanced.

Leaving La Paz, we crossed the Gulf to Mazatlan, our last stopping-place in Mexico. Here we found two ships of war, one English, the other American, the former was just leaving, with 300,000 dollars of silver on board, the produce of the mines in Sinaloa. Although my illness was beginning to take firm hold upon me, I dragged myself ashore at four o'clock in the morning to attend the market, and was well repaid for my trouble by the busy scene of animation I found there. A motley crowd of Yaquis, Negroes, Mexicans, and Chinese had filled a large, square market-place to overflowing with every kind of indigenous merchandise and produce, conspicuous amongst which were the fishes and fruits.

A country must be worth something which can produce such a market as this; no town in any part of Europe could have been better supplied. I bought as large a string of bananas as I could carry for a real (one shilling), filled my pockets with oranges, and beat a hasty retreat, for the noise was something frightful. All screamed at once in their

different languages, and seemed to consider that the more noise they made the more certain they were to sell their commodities.

From the market I visited the principal street, and one glance at the large shops and mercantile establishments showed the nature of business here. Many of the counters were polished mahogany, the windows plate-glass, the goods mostly of English manufacture. Here, as in the other silver-producing States, merchants of capital were absorbing the precious metal, and sending it out of the country almost as rapidly as it was taken from the ground. I watched the handfuls of large silver dollars rattle on the counters, and saw how very little the people could buy for their money. A common shirt, for instance, costs at wholesale prices about three shillings; on entering Mazatlan the import duties double it, the merchant adds another three shillings as legitimate profit, and, including a penny or two for carriage, it is retailed at two and a half dollars in coin. All this comes out of the pockets of the people, and if mining is prosperous, the traders make enormous fortunes, and can well afford to build the splendid establishments which contrast so strongly with the poverty and degradation seen on all sides.

I next went to the plaza. The clocks were striking eight, and the troops were being inspected. In this little place of 11,000 inhabitants, 2,000 soldiers were being maintained; there were more men drilling in the plaza than could be found otherwise engaged throughout the town. The appearance of these soldiers was a perfect burlesque; they wore straw hats with green ribbon, but here all distinction of uniform ended; one had a broadsword, another a flint-lock musket, a third a French rifle, a fourth nothing but a club, and all were clothed in coarse cotton cloth, called manta. It

was the old story; one of Juarez's generals was expected, and the present Governor of Sinaloa thought it desirable to be prepared. The General did appear some days afterwards, and both "armies" met, and compared their respective strength; but as the local force proved to be in the majority, Juarez's

Mazatlan.

men prudently returned to head-quarters, and the war was thus brought to a close without bloodshed.

The accompanying woodcut gives an accurate glimpse of Mazatlan, and will more than answer the purpose of a description. The long building at the head of the inlet is the custom-house; beyond the hills at the back lies the Pacific

Ocean, and the water seen about the centre is a shallow part of the harbour, which has to be crossed in boats. The harbour of Mazatlan is not a very good one, for it is exposed to the south-west gales in one part, and to the north-west in another, so that it depends much upon the prevalent winds what position is the best for anchorage.

I left Mexico with considerable regret, for another month might have been well spent in travelling through different parts of Sonora, in visiting the coal-fields on the Upper Yaqui, and in examining the silver mines of Alamos.

The greatest source of wealth possessed by Sonora is undoubtedly her mines. I visited many of them, although I did not reach Alamos; and shall therefore conclude this account of my trip by fairly stating as much of the reliable information I then collected as I think is of sufficient general interest.

CHAPTER X.

THE NATURAL RESOURCES OF SONORA.

Agriculture:—Extent of Cultivatable Land.—Agriculture on the Altar, San Ignacio, San Miguel, Sonora, Yaqui, Mayo, and Fuerte Rivers. *Crops*:—Cereals, Beans, &c., Cotton, Tobacco, Sugar-cane, Mulberry, Indigo, Edible Cactus Plants, Agave Americana, &c.—*Stock-raising*:—Sonora a fine Grazing Country.—The Grasses.—The Shrubs.—The Rain-fall.—Stock-raising under Spanish Rule.—The Formation of Tanks.—*Mining*:—Wide-spread Distribution of the Mineral Wealth.—The Precious Metals.—*Silver-mining*:—Mines about the Boundary-line.—History of Mining under the Spaniards.—Change for the worse under the Republic.—Mining Districts; those subject to the Mint at Hermosillo.—Average Yield of the Principal Mines.—Southern District, subject to the Mint at Alamos.—*Gold-mining*.—*Coal*.—Relative Value of Sonora as a Mining Country.—Conclusion.

AGRICULTURE.

THE amount of land susceptible of cultivation in Sonora bears a very small proportion indeed to that of the whole country. In the first place, long ranges of mountains cover vast districts; in the second, the valleys through which the rivers flow until they near the sea-coast are very narrow, and contain little bottom-land; and thirdly, where the valleys do open out towards the coast, they are rendered barren and unproductive by the sinking of the rivers, which thus deprives them of the means by which they might be irrigated.

For instance: of the rivers which drain Northern Sonora, the first irrigating dam on the Altar River is situated thirty-three miles above Altar. From this point the stream is a permanent one down to Los Puertecitos in ordinary years,

thirty miles below Altar; but the average width of the valley for this distance (sixty-three miles) scarcely exceeds three-fourths of a mile. On the San Ignacio River, villages are found all along its banks wherever sufficient water exists for irrigation; but so scant is the supply that as far from the mouth as Santa Anna the river bed is usually, except after rains, a broad sandy arroyo, all the water having been diverted and absorbed by the acequias belonging to the settlements higher up the stream, viz., Santa Magdalena, San Lorenzo, and Santa Marta. These villages, including San Ignacio, form an agricultural district which produces many thousand fanegas* of cereals, and supplies six flour-mills upon the river. Even the San Miguel River does not supply nearly enough water to irrigate the narrow bottom-lands which lie on either side of it. The three flourishing haciendas of Torreon, Labor, and Iñigo, as they are worked at present, absorb nearly all the water between San Miguel and Hermosillo, a distance of thirty miles; and, south of the latter town, a dry useless valley widens out indefinitely towards the sea. There is much cultivation on the San Miguel north of the village of that name, and also on the Rio Sonora above Ures, where a considerable population can be well supported. These narrow valleys have supplied nearly all the food consumed by the mining as well as the agricultural population of Northern Sonora, and have, during many years of civil war, notwithstanding the ravages of the Apaches, exported a considerable surplus of wheat and beans beyond the boundary into United States' territory, where Sonora wheat is a staple commodity.

The Yaqui, Mayo, and Fuerte rivers alone—rising in the lofty ranges and plateaux of the Sierra Madre, and not, as do

* 1 fanega (410 lbs.) = about two bushels.

the others along the divide which limits the Gila basin—carry down to the low lands along the coast an abundant supply of water, enough in fact, to irrigate all the low-lying districts situated between them, and representing not less than 2,500 square miles. It is this section of country, together with the special produce it is capable of yielding, which makes the agricultural resources of Sonora, in my opinion, of very great importance.

On all lands susceptible of irrigation two crops of cereals can, without difficulty, be raised in the year: a crop of wheat and one of maize, or wheat and beans, or even wheat and barley. The wheat is sown from November to January, and reaped in April—never later than May. The land is then given two months' rest. Maize is sown at the commencement of the rainy season—that is, about the 1st of July—and is harvested in November. The bean-crop may be sown even later than the maize, and the barley about the same time. The Australian wheat has been introduced with great success, for it ripens a month in advance of the ordinary kinds, and is not only out of danger before the season for smutting comes on (just before the summer rains), but a considerable time is thus ensured for the ground to lie fallow before sowing the second crop—a very necessary requirement.

Were Sonora, however, to become a populous country, and to be traversed by railroads, cereals only would be raised sufficient to supply the necessities of the miners and inland population; for cotton, sugar, and tobacco are far more remunerative, and thrive well all through the State.

Until the introduction of the Egyptian seed, cotton was cultivated with but little success in Sonora, for crops from the Mississippi seed, and other varieties, were very liable to failure. Now the Egyptian plant, properly cultivated, being

at least five weeks earlier than the American varieties, produces a certain crop, more or less productive, every year on land which can be irrigated at all seasons. On or about the 20th of March, when the frost is considered finally to have departed, the planter commences to sow his cotton, and what he sows in March and early April, he begins to pick in August. Cotton is sown even as late as July, but the season for it being consequently a short one, a third of a crop is all that can be expected from it before the frost, which generally appears the first week in December and destroys the plant for that year. It is also found by those who have cultivated cotton in this State scientifically, that if the crop be kept clear and free from weeds, the grasshopper will not prove to be a very dangerous enemy; for the warmth of the cotton, heated by the mid-day sun, is too much for the gorged insect, and the cooler resting-place which would be provided by the weeds having been removed, he leaves the field. The caterpillar also can be to a great extent kept at bay; for if the field be flooded as soon as this destroyer attacks the plant, the vapour in the day, and the cold evaporation at night, will destroy the insect, so that the planter may expect to reap a good percentage of his crop from the fresh pods, which are quickly reproduced after the land has been irrigated and the caterpillar destroyed.

Tobacco is sown as early as the frost will admit in March, and the leaves are picked during the summer and fall. I saw on the Altar River, in a field belonging to my guide, Van Alstine, some acres of tobacco on the 10th of December, 1867. The plants had yielded two large pickings, and, from the thickness of the leaf, there seemed to be one-third of a summer picking still forthcoming. There had been no frost up to that time, although the altitude was great.

The sugar-cane is cultivated upon the banks of all the

rivers I have named, but it thrives most luxuriantly in the Yaqui, Mayo, and Fuerte bottoms. It is sown every third, fourth, or fifth year, in January or February, and is cut down for sugar every year, in the winter season. The Yaqui and Mayo country is inhabited by two closely-allied tribes of Indians, from whom the rivers have derived their names. They are the most industrious people in the State, and are not by nature warlike. In every town, on every farm, and in many of the mines, they are to be found working diligently for hire; but as they are particularly devoted to agriculture, higher wages is demanded for any other employment. They are tall and athletic, very dark in colour, with a fine expression of countenance. Treaties are held sacred by them, nor have they ever been known to resort to arms, unless goaded on by the cruelty of the Spaniards or Mexicans. Never having had any instruction in agriculture, their own lands—the most productive in the State—are very poorly tilled; and as the rivers are rapid, and the banks for the most part high, irrigation has not been made use of by them as by the Pimas on the Gila, but they have confined their labours to the lowest strips of bottom-land which are subject to overflow, and to stock-farming. Their horses, horned cattle, and sheep, are reported to be far superior to any others in the State. Such cultivation even as these Indians have had recourse to, proves conclusively that the land is productive in the highest degree; and when we consider that frost on the Yaqui is rare and unknown southward, and that the Pacific coast is in close proximity, there is every reason to expect that rice and coffee will grow well there—for both flourish in Sinaloa—and that capital would rapidly develop these regions were not property rendered by bad government so insecure.

Besides these great staples of agricultural wealth, there are others which must not be overlooked. The mulberry tree thrives splendidly throughout the State, and is found in nearly every garden at Hermosillo, for the people here seem to have conceived the idea of raising silk-worms, but to have failed in the perseverance required to carry out the experiment. When the last census of the city was taken, the proportion of females to males was actually seven to one, and of late years this difference has increased. Such a surplus of female population could not be better employed than in the production of silk.

The Indigo plant is indigenous to the Yaqui, and is used by the Indians to dye their blankets with.

This is a great country for fruit—oranges, limes and lemons, dates, bananas, plantains, figs, and grapes, all flourish here, and are of fine quality; while the different varieties of cactus fruits are more highly prized by the people than all the rest, and grow on lands worthless for anything else, as they lie beyond the reach of irrigation. The Pitella (pronounced *Pitayo*) and the Sahuaro are the most prized. In the season the Indians live entirely upon them, and gain much money by selling them about the towns. They make a jelly and cheese of the former, and dry them both in the sun for winter use. The Sineta is a small variety of the Pitella. Then there is the Tuna, the delicious fruit of the *Nopala Castiliana*, which gives so much grotesque beauty to the gardens here. From the succulent trunk of the Viznoga an agreeable preserve is made, much used at Mexican tables.

The Mescal (*Agave Americana*) is another production of importance. The rocky, mountainous regions of southern and eastern Sonora are most suitable for its production; it grows, like the cactus plants, on dry barren ground. From the

tough fibre of the leaf excellent mattresses, matting, and ropes are extensively manufactured by the Indians, and used everywhere throughout the State. From the root is distilled the spirit of that name. Mescal spirit of the best quality, matured by age, stands on perfect equality with good whiskey, and is considered, as a spirit, to be very wholesome. If watered by the retailer it is ruined; and if adulterated with the products of the sugar-cane a much inferior article is produced. The process of making Mescal spirit has too often been told to allow of a description here.

Stock-raising in Sonora.

The great advantages which Sonora possesses as a stock-raising country cannot well be exaggerated. Grama stands first among the grasses; next comes a blue, coarse grass, greatly relished by cattle; then follow many varieties; all are perennials, so that in an unusually dry season they do not altogether fail, and the stock are preserved from starvation.

Besides the grasses, there are a great variety of shrubs and bushes that cattle thrive well on and eat with zest. The Mezquit and Paloferro usually yield in early autumn an abundant crop of beans, which are called by the natives Pechita. At this season all the cattle grow very fat. A species of wild sage, which grows in many places, gives the beef a peculiar and delicious flavour much extolled by the epicures of the country. All these dry and nutritious forms of food cover the inland plains everywhere, and furnish so large a supply and variety of fodder that I doubt if any country could feed more stock, acre for acre, than Sonora. In the narrow valleys there grows a weed (it was just coming up

when I passed through the country in the middle of December), the virtues of which, I am told, are very great. If a worn-out horse is pastured on it, his stiffened sinews soon relax. He fattens faster than on anything else, and soon acquires a new lease of life and activity. I met some Americans who were in the habit of buying broken-down horses in the States, and taking them down to Sonora to regenerate them.

The climate is all that can be desired; frosts, in winter, occur over the greater part of the State—a very necessary tonic for the health of the stock. Enough rain falls during the year to replenish the tanks of the stock ranches. The winters are never so severe as to require stall-feeding, nor do the occasional falls of snow lie long on the ground. The food changes with the seasons, and there is always an abundance. No diseases of any kind are known to prevail among the stock north of the line of frost, but farther south, on the rich lands of the Yaqui and Mayo country, periodical epidemics, similar to those of southern Texas, sometimes attack the high-fed cattle. While horses, horned cattle, and goats thrive well on the plateaux, fine wool-bearing sheep will prove remunerative in the mountain regions only, because the heat of the mid-day sun has been found to thin the fleece.*

Many districts were once famous for the enormous quantity of stock raised by the rancheros. Amongst these were San Pedro, San Bernardino, and Bucuachi, in the north-east; Altar and the country north of it; Norea, Cruces, and La Posa, north of Hermosillo; and many other places where not a head of cattle is now to be seen. It was pitiable to ride, day after day, for many hundred miles through magnificent

* Sheep-farmers of South Australia may think the last remark an error. Some varieties may be able to stand the heat without injury to the fleece.

grazing-lands, covered as far as the eye could reach with thick, short, delicate grasses, so sweet and nutritious, and never to see even the hoof-print of any kind of stock. The whole of northern Sonora may truly be said at the present time to be completely swept of cattle. What the Apaches left were taken to supply the contending armies. With the cattle went the people, driven by fear into the towns and larger villages; so that now the ranches are deserted, the orange-groves grow wild, and the few stray cattle which now and then flee at the approach of the traveller have long lost their masters. So depopulated are these vast grazing regions that even the Apaches have ceased to visit them, for there is no plunder to take, no animals to drive away.

Under the protection of a strong government what a paradise this country would be to the stock-farmer! Not obliged to roam about in search of fresh grass and water, he can choose a suitable place for his stock-ranche, and dig his tank in a hollow to which drainage sufficient could be directed to fill it; no covering being necessary for the stock, he can confidently rely upon the variety of pasturage, and the succession of natural crops to keep his cattle always well supplied with food.

The Mineral Resources of Sonora.

Almost the whole of this State is remarkable for the widespread distribution of its mineral wealth. There is scarcely a hill that does not show signs of gold, silver, or copper ores —scarcely a brook that will not yield to the miner the colour of gold. But how large an extent of country, or how many localities are likely to prove sufficiently rich in minerals to pay, is a question impossible at present satisfactorily to answer.

The general character of the veins about the boundary line and in northern Sonora is, that they are narrow, often very rich, generally very numerous, but capricious—giving out, or changing their direction so continually, that the miner can never feel certain of his prospects beyond what he actually sees as day by day he develops his mine. There are some exceptions to this, such as the large masses of mineral giving a low percentage of precious metal which are situated about the head-waters of the Rio Santa Cruz, forming what is called the Santa Cruz mining district. To develop this region, many mines were opened, called the French, the Empire, Boundary, Patagonia, &c. The ores yielded but thirty dollars of silver per ton. They were so easily reduced (being argentiferous galena), that mining prospered here until the troops were withdrawn at the breaking out of the American civil war, and the region was left to the mercy of the Apaches, who nearly succeeded in massacring those who were working the Patagonian Mine, drove off the stock, and made mining for a time impossible. Much fine machinery now remains idle; for up to the present time the miners have not resumed work.

A second district (the Cababi), situated about sixty miles west of St. Xavier del Bac, has now about six mines being worked upon it. The ore is the black sulphuret of silver, and yields an average, including first, second and third grades, of 100 dollars per ton.

A third district is called the Tucson district: it occupies the mountains immediately to the west of that town. The ores are very rich; but the veins are thin and capricious.

In the Santa Rita Mountains there is a fourth district of the same name (Santa Rita). Silver mines were opened here; but since the manager, Mr. W. Wrighton, was killed

by the Apaches, all work has ceased. The largest enterprise was that which led to the opening of the Colorado Mine, and caused the erection of the twenty-stamp mill and other machinery now standing at Enviguetta, which I have already mentioned. Mismanagement and extravagance brought this company to ruin.

The above districts are all in United States' territory. They represent the first abortive attempt at silver mining in the south, and tend to show that the natural disadvantages peculiar to these regions are at present almost too great to be overcome. Labour and provisions are high, the expense of transporting and putting up machinery is enormous, water is scarce; but for all that the silver is there, and will eventually be got at.

In forming a true conclusion as to the value of the mineral resources of Sonora, the history of its mining operations is a very necessary part of the evidence. Sonora and Sinaloa, under Spanish rule, were one State, and had their base of supplies, not at Guaymas, Agiavanpo, or any harbour on the Pacific coast, but at Vera Cruz. From this far-distant port, all the supplies sent from Old Spain to the settlers—everything, in fact, that they required—had to be packed on mules, a distance of 2,000 miles, first to the city of Mexico, thence along the great military road to Chihuahua, across the Sierra Madre *viâ* Concepcion, to Arispe, the then capital of Sonora, where the troops were paid, and from which point supplies were distributed to the military posts and missions scattered all over the country. But notwithstanding the remoteness of the province from its base of supply, the Spaniards during nearly a hundred years of peace, and under the protection of a strong military government, carried on their mining and agricultural operations most vigorously, discovered most of

the large rich veins throughout the country, and worked them to a very considerable extent.

The government exacted from the miner five per cent. of the gross produce of his mine; and gave him military protection in return. But the Spaniard, although the Indian population afforded him abundance of labour to work the mines, had neither machinery to use when the water-level had been reached, nor the knowledge necessary for reducing the rich sulphurets which he was pretty sure to encounter at that point.

The system of reduction known as the "patio" worked well in the reduction of the free ores which had been oxidised above the water-level; but other systems of reduction being there unknown, the mine was generally abandoned when the water-level had been reached. Even the necessity of abandoning the mine before it was half worked out naturally led to the discovery of a greater number of veins and a more thorough investigation of the mineral resources of the district; and thus the whole country was thoroughly prospected. No capital was used to develop the mine, no tunnel was bored to drain it; but still, with the croppings alone to represent the capital, and the Indian slaves, the labour and machinery, the production was far greater than it has ever been since, or probably will be for many years to come. This was the state of the mining interest up to 1827, when all the energy, ability, and capacity for organization was suddenly withdrawn from the country when the Spaniards were banished by the new-born Mexican Republic.

When the mushroom creole aristocracy sought in the mines for the wealth which had made their Spanish masters' so enviable, knowing nothing in most cases of mining, they left the management of it to others, squandered the proceeds

when the vein was productive, and reserved nothing for the future when unremunerative work should become necessary; and thus many fine mines were abandoned when a small expenditure would have again made them profitable.

Besides the indolence, extravagance, and ignorance of the new owners, a second blow fell heavily upon the mining interest—the withdrawal of troops from the frontier provinces to take part in the intestine strifes nearer the centre. The Opitas rebelled and caused much damage to the mining districts of the north-east; the Apaches discovered how things were, and poured down from the north in larger hordes than ever.

The third adverse influence was the work of the Gambosinos. Under the mining laws of New Spain, the miner was obliged to support his mine by leaving a sufficient number of pillars (formed of ore not removed) to ensure its safety; but under the Republic no laws could be enforced, and when the mines became abandoned, they immediately fell a prey to the Gambosinos (men who worked in companies, but each for himself), and as the pillars came first to hand, and yielded immediate returns, they were removed, and, in consequence, down came the walls, burying beyond reach the unexhausted treasures of the mine itself. Thus it is that most of the old mines of this State, the best and most productive, having enriched their original owners and being still unexhausted, are now mostly buried under their own ruins. Notwithstanding this, the general opinion amongst those who are capable of forming one is, that the path which leads to the most important mineral deposits is sure to be found by following, to a great extent, the footsteps of the Spanish miners. They found the best veins, and would have increased the production of silver year by year, had they not

been driven away, leaving for others mines which are only half developed, and which contain their precious metals in the best possible form, now that we know how to manipulate them—I mean as sulphurets. But to get at these it is necessary that capital should be expended which cannot at the outset be remunerative, for a tunnel to drain an old mine cannot be bored in a day, much less can the débris be cheaply removed. When Sonora becomes Anglo-Saxon there will be some hope for the future—until then, there is none.

The following are the chief districts in which silver mining has been or is still carried on.

1. Alamos, in the south.
2. Barojica, between Rios Yaqui and Mayo.
3. Santa Juliana, near Los Cedras.
4. San Marcial, on the Rio San José.
5. San Xavier.
6. Los Bronces,
7. San Antonio de la Huerta. } Upper Yaqui.
8. La Barronca.
9. San Juan de Sonora.
10. Babicamora,
11. Banawachi, } in north-eastern Sonora.
12. Nacasari,
13. Zubiate, forty miles south-west of Hermosillo.
14. Aquagu (Minos Prietòs).
15. Alameda.
16. Zaric, Rio Altar.
17. La Cieneguita,
18. Mulatos, } between Saguaripe and Jesus Maria, in the Sierra Madre.
19. Jerva Buena,
20. La Cananea,
21. Soyopa, Rio Yaqui.
22. Limposos.
23. Carrigole.
24. La Dura, Rio Chico.
25. Relitos.
26. Tecoripa, twenty miles west of San Antonio.
27. Batopilas,
28. Chimipas, } head-waters of Rio Fuerte.
29. Urique,
30. Bucuachi.

Outside these districts scattered ledges of gold or silver

bearing quartz are of course to be met with, and there are many insignificant localities not named in the above catalogue; for almost every ranche has some favourite mine near it, the boundless wealth of which forms part of the belief of the inhabitants, who, however, seldom show energy enough to put their belief to the test.

The above districts are subject, according to their position, either to the mint at Hermosillo, or that at Alamos, in the southern part of the State. The average amount coined at these establishments during the five years preceding the Maximilian war was about 60,000 dollars per month at each mint. During the war, that is for nearly three years, both mints were stopped, and since that time Hermosillo has been coining about 30,000 per month, Alamos, 60,000, with every probability of an increase to 70,000 or 80,000 dollars in a few months' time, on account of the productiveness of some mines recently taken up in the vicinity.*

1st. The district tributary to Hermosillo.

The Bronces and Trinidad mines, besides the Nahuila worked with the Bronces, are owned by a Mexican, Matias Alzua by name. The former, from January to November of 1867, furnished 83,000 dollars to the mint; the latter, 15,500. In both, all the rich ores were sent to Europe for reduction. The Bronces and Nahuila supply a mill of twenty stamps, but they could keep twenty-five stamps always employed. The Trinidad supplies a fifteen-stamp mill, which ought to be increased to twenty. The El Taste Mine (Tecoripa district), worked by an American company, sent, up to November, 1867, 38,000 dollars to the mint. A ten-stamp mill is equal

* The particulars here stated were gathered from persons on the spot in December, 1867; I have especially to thank Mr. Johnson of San Marcial, and Mr. Simons, part owner of the mint at Hermosillo, for rendering me so much assistance in obtaining reliable mining information.

at present to its requirements. There are several mines and mills lying idle in this district, some from mismanagement, some for want of ores. The San Marcial American Mining Company has sent, in the last two months of the same year, 17,000 dollars from their ten-stamp mill. The Governor's mine at Banawachi has sent this year, up to November, 15,000 dollars from its twenty-stamp mill. In the Babicamora district, below Arispe, a Mexican is erecting a mill, which promises to be remunerative, as much silver was formerly obtained here by the old patio process. At La Dura (Rio Chico) a Mexican company is commencing work. Then La Barronca (San Antonio de la Huerta district) produced considerable silver for two years, but this has been temporarily arrested while a tunnel is being made. At Chipionena an American company is also commencing work. At Zubiate a Mexican company sent 30,000 dollars to the mint in 1867, and expected to double that amount in 1868. The mill works fifteen stamps. Besides Banawachi, Governor Pesquera has a mine at Cananea (three days' journey north of Arispe), of lead, silver, and copper. This was a good mine, but having been abandoned during the revolution, the Apaches burnt the steam engine and destroyed the smelting works. Santa Theresa and Los Ginga of Zuape are both good mines, and worked to advantage. The yield of the above veins, taking an average of all the ores, is about the following:—

	Dollars per ton.
Bronces	50
Nahuila	150
Trinidad	150
San Marcial . . .	100
El Taste	100
Chipionena . . .	60
Zubiate	50
Banawachi	35, 17½ of silver and 17½ of gold.
Babicamora . . .	60, also partly gold.

2nd. The southern district, tributary to Alamos.

There is no district in the State to compare in importance with that of Alamos. The two great veins, if they are not the same vein, are the Promontoria and the Tirte.

The Promontoria Mine belongs to the heirs of Almuda, and has produced many millions' worth of silver. Before the late war, the owners were in treaty with an English company to sell the mine for 150,000 dollars. It was then full of water, and could not be thoroughly examined. Since then an American company, which bought the Tirte Mine, has, by driving a tunnel, completely drained the Promontoria, and I have since heard that the English company are again prepared to bid for it. The famous old mine, the Deus Padre, is also on the same vein, and is being reopened by an American company. The vein upon which these mines are situated is fourteen yards in thickness, and all metal, yielding an average of from sixty to eighty dollars to the ton. The ore is black sulphuret of silver. Eighteen leagues from Alamos is situated the famous mine of Don Miguel Urrea—the Palmarejo. This mine, by the Mexican process alone, can still produce 30,000 dollars per month, whilst one thousand "barreteros" can work at one time in the passages of its "labores." A mine bought for 150,000 dollars by the English company which is in treaty for the Promontoria, and situated at Uruachi, is yielding large quantities of silver, and quite equals the expectations of the owners. A new silver mine has recently been discovered near Soyopa, on the Rio Yaqui, the ores of which are abundant, and yield by the simplest Mexican process of amalgamation, without need of roasting, from 400 to 800 dollars per ton.

Alamos also receives silver from Batopilas (in which district there are no less than six hundred distinct veins), Jesu Maria,

Juaguparis, Chinipas, Urique, and several other smaller districts in the mountains about the borders of Chihuahua and the heads of the Rio Fuerte.

Besides the silver contributed by the few prominent mines already referred to, there is a considerably less, though appreciable, amount brought in driblets by the Mexican mining population inhabiting chiefly the districts named, who support themselves by this means. These people, chiefly Gambosinos, are the best possible judges of ores, but the worst possible hands at their reduction. As, however, the mineral wealth of the State is so diffused, and as there are such countless numbers of narrow rich veins, an indefinite increase of silver might be supplied from this source, if the country were cleared of Apaches and robbers, and the miners enabled to work in peace.

As a gold-bearing State, Sonora has not become as yet conspicuous. The production has never averaged more than one-seventh in value that of silver, and of late years has seldom exceeded one-twelfth. There are not three stamp mills crushing gold quartz in the State. Placer mining is carried on chiefly by the Indians in different places all over the State, but only during the wet season.

Some of the chief districts for placer mining are—

Los Lanos, near the main road from Hermosillo to Altar.
Metape, eighteen leagues from Ures.
La Brisca, near Arispe.
Bucuache, ,, ,,
San Antonio de La Huerta, Rio Yaqui.
La Bonanata, near San Marcial.
Barajita, south of Santa Anna.
La Sombrareta, west of Zarie.

The question of coal supply to the Pacific coast is one of the greatest possible importance. There are many places in California where lignite and inferior coals come to the surface;

the most important of these districts is the Monte Diabalo basin, near San Francisco. The best proof of the quality of this coal is that the annual production has not yet reached 100,000 tons; it is only fit for consumption in private houses and for a few other purposes. All the coal used for shipping, blacksmiths' forges, steam engines, &c., is imported into San Francisco from Vancouver's Island, where there is an abundance of the best qualities.

Now in Southern Sonora the true carboniferous strata are to be found, and with them an abundance of coal. It lies, unfortunately, too far from the sea-coast to be of any practical value at present; still it is there. I examined specimens from several localities, but cannot say much for the greater number. San Marcial, sixty miles from Guaymas, is the nearest point to the coast where large quantities are to be found. What I saw from that place, however, was not good. The good coal lies far away in the interior, upon both sides of the Upper Yaqui River, and from some spots there I obtained specimens equal in every respect to the finest coal of Newcastle or Pennsylvania. The future of Sonora depends, of course, greatly upon her coal. There can, in fact, be no doubt but that Sonora contains much mineral wealth; she cannot vie with such States as Guanaxuato or Zacatecas, nor have any veins been yet discovered equal to that of the Real del Monte, the Sombrerete, or La Luz; but so uncertain is mining, and so little known is Sonora, that, any day, some Vita Madre or Vita Grande may be discovered which will rival those of the above-named States.

As regards her sister State, Chihuahua, it was my opinion on leaving Mexico that the eastern State was the richer of the two; the mineral wealth is more concentrated, and some of the veins near the city of Chihuahua, although abandoned

now, were enormously productive. I read with great interest Mr. Charles Sevin's paper on the mines of Chihuahua, in the "Journal of the Royal Geographical Society for 1860." Here much valuable information will be found on this subject.* The only other information on Chihuahua I can name is to be found in "Dr. Wislizenus' Tour to Northern Mexico, 1848 (30 Congress, No. 26)." These reports confirm me in my belief that Chihuahua is a State of no ordinary merit, and surpasses Sonora both in mineral wealth and fertility.

The absorption of the four northern States of Mexico by the Great Republic will be a real gain to the civilised world, and ought to be a source of unfeigned congratulation to all branches of the Anglo-Saxon family, as a fresh and valuable addition to their territories. No nation understands the "development" of a new country so thoroughly as the Americans; and they know well what they are about. The time has not yet come when this rich addition of territory can be quietly and inexpensively absorbed into the Union. A

* "Santa Eulalia," says Mr. Sevin, "a little town of 1,500 inhabitants surrounded by several hundred mines, is only five leagues distant from the town of Chihuahua, where ever since 1703 the ores have been transported for their metallurgical treatment, the situation of the mines themselves being rather unfavourable for that purpose. By the immense wealth thus concentrated at Chihuahua, the population of this city, now reduced to 12,000 inhabitants, was raised at one time to 76,000. In the space of ten square leagues more than two hundred mines have been worked, and upwards of fifty of them have been sunk to the depth of 200 yards. Some of them are so extensive that a whole day will not suffice to see the different parts of one alone.

"With regard to the immense amount of silver extracted from these mines, the following statements will be found interesting. At the most flourishing time a contribution was raised of two grains of silver from every marc ($\frac{1}{2}$ lb.) extracted, for the purpose of building two churches. They were built in a few years; the cost of one was 600,000 dollars, that of the other 150,000, and a surplus remained of 150,000 dollars. Thus the contribution amounted to 900,000 dollars, and represented an amount of metal equal to 145,000,000 dollars extracted from the mines of Santa Eulalia in the course of a few years.

"In the year 1833, a census of the whole amount was made, and it reached to 43,000,000 marcs of silver, or 430,000,000 dollars" (a dollar = 4*s*. 2*d*. in silver).

trans-continental railway must first be completed through the southern territories of the United States; there must be a fair sprinkling of American settlers scattered throughout the States to be acquired, so as to lead the people in the paths of enlightened republicanism; and the Mexican population, at present ruled by Congress, must be more firmly united to the Americans by the bonds of political freedom. All this I am confident will be done in time, and a very few years will elapse, after the boundary line has been again moved southward, before we shall find railroads traversing the country—a line to Chihuahua, another to Guaymas, or, still better, to Toquivampo or Mazatlan, and a third, perhaps, entering from southern Texas. Then will follow a rapid increase in the production of the precious metals, a result which directly affects all nations burdened with a heavy national debt.

Sonora and Sinaloa, with a fine healthy climate of which States farther south cannot boast, situated, moreover, along a coast well supplied with harbours, and having an industrious Indian population accustomed to labour, should hold a similar position towards the Pacific States, as the South naturally occupies towards the North. All the semi-tropical productions, such as rice, sugar, coffee, indigo, cotton, and tobacco, should here be grown for California and the Northern Pacific; while mining, machinery, merchandise, and all the luxuries which accompany Anglo-Saxon civilisation, would form the obvious articles of exchange. Thus, although the present is a day of darkness to them, there is more promise in the immediate future for these northern provinces than for any other part of the Mexican Republic.

CHAPTER XI.

HOW THE SURVEYORS FARED ON THE 35TH PARALLEL.

Alone in San Francisco.—Arrivals.—The Surveyors on the 35th parallel.—El Moro.—Spanish Inscriptions.—Dr. Parry at Zuñi.—Sierra Madre.—Colorado Chiquito.—Mount Agassiz and the San Francisco Peaks.—*General Palmer's Narrative*:—Difficulties of a Cañon country.—Sycamore Cañon.—Indian Attack.—Scaling the Walls.—Attempt to skirt the Cañon above.—Failure.—Again enter the Cañon.—Night.—Firing into the fire.—Camp at last.—The fate of Signor and Don.—Lessons taught by the Fight.

Week after week passed slowly away at San Francisco; I was quite an invalid, and thereby learned to appreciate perhaps more thoroughly than I otherwise should have done, the advantages of some of the institutions of America; and that too without any expense, for I was very short of money at the time, having carried as little as possible with me through Mexico. I became member of a first-rate library, where, amongst other luxuries, the English journals and daily papers regularly arrived. Every morning I searched the provincial news of the south to get a glimpse at the progress of our surveyors. But with the exception of finding that three of my friends, General Palmer, Major Calhoun, and Dr. Parry, had reached Fort Mojave on the Rio Colorado, and that the centre of California was impassable on account of the floods, not the slightest clue could I discover as to their whereabouts.

It rained for three weeks day and night incessantly; it was too sultry for warm clothes, too damp for cool ones; yet I must confess that San Francisco, even when seen to the

Vincent Brooks Day & Son. lith

greatest disadvantage, as I saw it, is one of the pleasantest cities in the world. It is the least American city in the States, and yet it has all that is good of American institutions. Cosmopolitan of course it is. Every morning I had my boots blacked by an African, my chin shaved by a European, and my bed made by an Asiatic; a Frenchman cooked my dinner, an Englishman showed me to my seat, an Irishman changed my plate, a Chinaman washed my table-napkin, and a German handed me my bill. But of this delightful city I will not say a word; an old college friend of mine has already given the public so vivid a sketch of San Francisco, so full of thought, vigour, and truth, that nothing remains for me but to render to Mr. Dilke my best congratulations on the complete success of his delineation.

At the end of the seventh week, my own party arrived by sea from San Pedro; two days later, another came in from the 35th parallel; and the next morning, when I went from my hotel, the *Cosmopolitan*, to hear the latest news at the *Occidental*, in came five of the shabbiest-looking fellows I ever saw. Their coats were torn, their caps washed into shapeless mushrooms of felt, their faces tanned and bearded, and their figures covered with mud; these were Palmer, Colton, Calhoun, Parry, and Willis; all my old friends had arrived together. What congratulations we had! How we startled the "Frisco" dandies who were languidly perusing the morning papers; with what determination they (Palmer and party, not the dandies), sat down to breakfast while the waiters covered the table with the choicest fare of the best hotel in the States; and how they enjoyed that first "square meal" of civilization!

The festivities, the convivialities, the cocktails, and the punches which followed, soon instilled new life into me, and

enabled me to shake off the dregs of a fever which seemed until then determined to keep me down.

As may be imagined, so much was said about the surveys, that those who had been on the 32nd parallel almost fancied they had traversed the 35th also, and those who had devoted their energies to exploring the Colorado Chiquito, felt that they knew just as much about the Gila. For my own part I can scarcely believe that I have never read the Spanish inscriptions on El Moro, or tried to trade, like Dr. Parry, with the Indians of Zuñi, or that I did not form part of Palmer's little band when they were attacked by the Apaches in Sycamore Cañon; that the San Francisco peaks and the lovely parks around them have only as yet been seen with the eye of fancy; and that James White, the hero of the Great Cañon, did not tell his wonderful tale to me. On the way back, when Palmer, Colton, and I recrossed the continent by stage through Salt Lake City, we worked out together many of the little problems in physical geography which I have mentioned in this book, and killed the monotony of the dreary hours by comparing notes of our different journeys.

I devote this chapter to a brief notice of some of the most interesting features met with by the surveyors on the 35th parallel. The region they traversed was far richer in objects of interest than that farther south, by which I completed my crossing of the continent. My original intention was to have taken this more northern route, but a doctor was wanted on the 32nd parallel, and as a professional photographer arrived from the States just in time to accompany the parties on the 35th parallel, I found it advisable to alter my plans, and to become doctor and photographer of the southern half of the expedition.

I shall not describe the different routes taken by the

separate parties, for such an attempt would fill a volume instead of a chapter, but I shall relate, with the help given me by my friends who were present, the most interesting adventures met with on the way, and shall sketch here and there the country traversed by them.

Whilst two parties were surveying north of the bold volcanic cone, San Mateo (Mount Taylor), west of the Rio Grande, and exploring Navajo Pass (Campbell's Pass), the third was travelling south of the mountain; visiting the interesting pueblos of Laguna and Acoma, examining Inscription Rock, which the Spaniards named El Moro, and making the acquaintance of the Aztec Indians of Zuñi.

On approaching Inscription Rock you are struck with its wonderful resemblance to a Moorish castle, and acknowledge at once the justice of the old Spanish name. It is—as may be seen by the engraving, an exact copy of a photograph taken by our professional artist—sufficiently large to be a fine landmark for the surrounding district, and it is fortunate for us all that the earliest Spanish pioneers thought so too, for they have engraved their names and the dates of their expeditions on every side of the rock, leaving behind them a record of events, some of which would otherwise have been entirely lost to history. Close to the left hand corner, almost hidden by the brushwood, is the most ancient date of all.

"Don Joseph de Basemzeles, 1526."

Arranging the inscriptions in chronological order, and using the translation furnished by Lieutenant Simpson in his report, we find the following:—

"Passed by this place with despatches . . . .
16th day of April, 1606."

"J. Aparela, 1619 (hieroglyphics not decipherable).

"Governor and Captain-General of the Province of New Mexico, for our

Lord the King, passed by this place, on his return from the Pueblo of Zuñi, on the 29th of July, of the year 1620, and put them in peace at their petition, asking the favour to become subjects of his majesty, and, anew, they gave obedience; all which they did with free consent, knowing it prudent as well as very Christian . . . . (words effaced) . . . . to so distinguished and gallant a soldier, indomitable and famed, we love;" . . . . (remainder effaced).

"JUAN GONZALES, 1629 . . . . MANUEL . . . . " (probably Francisco Manuel).

"Passed this place, Sergeant Major, and Captain JUAN ARCHULETA, and the traveller DIEGO MARTIN BARBA, and Second Lieutenant JUAN YNES JOSANO, in the year 1636" (hieroglyphics).

"ARITOMA GON SALEZ, in the year 1667 . . . . country of Mexico, in the year 1632. Folio . . . . BENGOSO, by order of Father LEBADO LUJAN."

"Here passed General DON DIEGO DE BARGAS, to conquer Santa Fé for the royal crown, New Mexico, at his own cost, in the year 1692."

"In the year 1641 BARTOLOME ROMELO . . . ."

"ANTONIO B . . . . DON FRANCESCO . . . . for the impossibility . . . . JENE . . . . there to subject; his arm undoubted, and his valour, with the wagons of our Lord the King, a thing which he alone did—E. FECIO DE ABTOSIO—six hundred and twenty-nine" (probably intended for 1629).

"In the year 1696 passed D. M." (hieroglyphics).

"Captain JUDE VUBARRI, in the year of our Lord 1701."

"JUAN GARCIA DE LA RIVÂS, Chief Alcalde and the first elected of Santa Fé, in the year 1716, on the 26th of August. By the hand of BARTOLO FERNANDEZ ANTONIO FERNANDEZ MORO."

"AUGUSTINE DE YNOJOS."

"In the year 1716, upon the 26th day of August, passed by this place DON FELIX MARTINEZ, Governor and Captain-General of this kingdom, for the purpose of reducing and uniting Moqui . . . ."

"Licentiate Chaplain Friar ANTONIO CAMARGO, Custodian and Ecclesiastical Judge."

"SIMON DE SALAS."

"ANTONIA NOMOYA."

"On the 14th day of July, of the year 1736, passed by this place General JUAN PAEZ HURTADOR, Inspector; and in his company, Corporal JOSEPH ARMENTA, &c."

On the 28th day of September, in the year 1737, arrived at this place the illustrious Doctor DON MARTIN DE LIZO COCHEA, Bishop of Durango, and on the 29th left for Zuñi."

"JOSEPH DOMINGUEZ passed by this place in October, and others, September 28, with much caution and some apprehension."

There are many other Spanish names of later date and less interest.

Vincent Brooks Day & Son Lith

EL MORO. (INSCRIPTION ROCK.)

When Lieutenant Simpson added his own name, and that of many of his party, to the above inscriptions, on September 18th, 1849, there was only one previous inscription in English, this was:—

"O. R., March 19, 1836."

Since then, Whipple's expedition and the names of many of his party; Beal's expedition, and the names of some of his companions; many more names of Californian volunteers; and, lastly, the chief names connected with the present survey of the U.P.R.W., E.D.,* have been added to the list; so that now, what with Indian hieroglyphics and English names, the old historic ones are harder to decipher than ever.

I heard some curious stories about the behaviour of my friends Dr. Parry and Major Calhoun during the few days they were encamped at Zuñi, which is situated but a few miles west of El Moro. Their love of science and Indian curiosities had led them, I believe, to invest about one hundred dollars whilst at Santa Fé in things which they thought would be most prized by the Indians to be met with on the way. With great difficulty they had succeeded in transporting their goods and chattels to Zuñi, and here they determined to unfold their rich treasure to the envious eyes of the untutored savage. They wanted to exchange their sham *bijouterie*—radiant with the largest diamonds and brass—and their fine linen made of cotton print, for the embroidered robes, weapons, native implements, and other objects of Indian vertu possessed by the Zuñians.

These good people, however, did not seem to relish the exchange; nose-rings, ear-rings, and other adornments, produced not the least effect upon them; even Calhoun's best speeches failed to raise the bartering emotions of the tribe.

* Then the Union Pacific Railway Company, Eastern Division.

The doctor had broken down his favourite mule by the length of his geological rambles, but he failed to obtain a substitute in the shape of a pony from the Indians. They accepted his gifts with much apparent gusto; they willingly —rather too willingly—accompanied him in his search for fossils and flowers; they exchanged their corn for goods when a very advantageous offer was made them, but everything of value they kept to themselves.

Our party only succeeded, after infinite bargaining, in obtaining two small sheep out of their numerous herds, and left, fully persuaded that the Zuñians were the "smartest" traders west of the Mississippi.

Zuñi is situated fifty miles to the west of the dividing ridge of the continent, called in consequence the Sierra Madre; the divide is crossed *viâ* Navajo Pass at an elevation of 7,177 feet, through Zuñi Pass at 7,926. Much coal crops out in many places on the way to Zuñi from the Rio Grande valley, and the country about this pueblo is very beautiful and fertile, producing abundance of fruit, chiefly peaches, and large crops of maize, without irrigation.

The western slopes of the Sierra Madre are considered by General Palmer to be infinitely superior in every respect to those of the Wahsatch Range, which the Mormons have colonised for several hundred miles with a population amounting to 100,000 souls, converting that so-called desert into plantations, orchards, and fields of waving corn.

About one hundred miles west of the continental divide the main line reaches the Colorado Chiquito, and follows the valley for about fifty miles; for which distance it varies in width from one to three miles, and possesses a rich alluvial soil, with abundance of running water for irrigation. Then comes a short cañon, above which the valley is fertile and

beautiful, varying in width from three to five miles, for fifty miles farther, when it is merged in a huge cañon which extends with unbroken walls to the Rio Colorado.

Leaving the valley of the Colorado Chiquito, the line next passes for one hundred miles through the most beautiful country on any part of the route from Kansas to California.

To the south lie the Mogollon Mountains, thickly timbered and well watered; towards the north and north-west extend the parks and grassy plateaux from which the San Francisco peaks rise so superbly. Winter and summer the whole country is thickly covered with nutritious grasses; the soil is black and rich, from the decomposition of the lava that has been ejected in immense quantities from the extinct crater of Mount Agassiz and its three companions, and is capable of producing, without irrigation, wheat, barley, oats, potatoes, and all temperate produce in abundance. This is the country of which Beal—himself a great traveller—declares, "It is the most beautiful region I ever remember to have seen in any part of the world. A vast forest of gigantic pines, intersected frequently by extensive open glades, sprinkled all over with mountains, meadows and wide savannahs, and covered with the richest grasses, was traversed by our party for many successive days." (See Frontispiece Vol. I.)

The most attractive place of summer resort on the line of the road will be here on the slopes of Mount Agassiz. It has every attraction—scenery, sky, water, elevation, climate; and proximity to the greatest natural curiosity known on the American continent,—the Great Cañon of the Colorado, from which it is distant some forty or fifty miles.

The streams which flow from the San Francisco peaks into the Rio Verde, a northern tributary of the Gila, cut their several ways deeply into the plateaux lying to the southward

over which they pass, thus forming innumerable cañons which bar the way westward in the less elevated and apparently smoother country below their mountain-sources. It was not the wish of our surveyors to carry a line of railway over the actual base of the San Francisco peaks at an elevation exceeding 7,000 feet for 100 miles, if a lower grade could be obtained farther south. With this object in view, General Palmer, after having pushed rapidly forward in advance of the parties to Prescott, determined to retrace his steps through this intricate cañon country, and ascertain if there was any possibility of finding a practicable route through it. He was accompanied during these excursions by Hinchman, whom my readers will remember as one of my companions in the earlier chapters; and he had also a small detachment of soldiers and a few more members of the survey to assist in the work; at one time General Gregg, who happened to be at Prescott, joined him with his escort. As General Palmer has himself furnished me with a short account of his adventures whilst conducting these reconnoissances, written on the spot with all the freshness which the vivid recollections of scenes just passed alone can give, I will tell the story in his own words:—

Camp in Signal Cañon, Eastern Foot of Mogollon Range,
near San Francisco Mountain.
Arizona, Dec. 8, 1867.

After climbing and scrambling among these mountains for more than two weeks since leaving Prescott, endeavouring to find a route eastward to the Colorado Chiquito without passing over San Francisco Mountain, I have at last reached the valley of that river, and am waiting here in camp this pleasant December Sunday for the return of Hinchman, whom

I have sent down the river to get news if possible of Greenwood's whereabouts. Hinchman will probably find a mound there with a letter buried, containing an account of Greenwood's movements, and stating where we can find him. We have two signal fires burning on the highest points overlooking our camp to guide Hinchman to us, and from this we have called the tributary of Cañon Diablo in which we are encamped, "Signal Cañon." I have called it a camp, but it is only a "high-toned" bivouac, as we parted with tents and wagons a fortnight ago, and since that time have relied on pack mules, and even these have been unable to cross the rugged country through which this reconnoissance has been made without sacrificing some of their number to the good of the cause.

Last Monday, for instance, at the close of the day, while following an old Indian trail across one of the Mogollon ranges, suddenly, without the least previous indication, there yawned at our feet one of those fearful chasms—the terror of all tired travellers, when they think a few more miles of gentle march will bring them to a good camping spot—which are here one of the great characteristics of the country. If "unexpectedness" be one of the elements of romantic grandeur in scenery, this gulf of brown and grey rock has high claims for pre-eminence in this respect, with its precipitous sides, 500 feet deep, and apparently so narrow that it is at first difficult to appreciate fully the hard fact that, before you can continue your march, it is absolutely necessary to descend to the very bottom, and then, if you can, to ascend on the other side. Perhaps days would have to be consumed in heading the inexorable channel. There is no help for it, and although the tall spruce trees in the bed look like saplings, and the stream of water rushing along

among great boulders resembles a thread, and your head swims as you gaze down from the brink, the course lies east-north-east; and where none but the Apache has ever gone down before, and he on foot, you have to lead your horse, jumping out of his way when he slips and slides on the bare rock, and dodging the loose boulders which are rolled down by the column following you.

It is assumed in this country that wherever an Indian has made a foot trail a pack mule can follow. We expected to come across many such paths, and, after our previous experience, would have been much surprised had we not met some of the trail makers as well as their trails. In the ascent of this cañon by which we are camped there was considerable difficulty. One strong mule, who had nearly reached the top, slipped and rolled over and over till he reached the bottom—dead. Another tumbled nearly as far, but must have had a very steady and well ordered brain, as the moment he struck the river-bed below, he stood up on his feet, and has made a day's march with us since; but we had to shoot him yesterday. A third tumbled half-way down, and is an ugly spectacle, with his gashed eye and flank, but is marching along all right now, doing regular service.

But very few days have passed since leaving Prescott in which we did not meet recent signs of Indians; the rude wigwams of bunch grass and branches, which the Arizonians call "wicky-ups;" the moccasin tracks; the mescal heaps, where the Indian has been roasting his supply of winter subsistence, composed almost entirely of this root; the sweating-house or earth oven, which he gets into when sick, and which is almost his sole remedy for disease; the fresh trail, and the "rancheria," or village of a greater or less number of wigwams.

We have been surrounded by these constantly, but all were abandoned; and although the stealthy Apache was watching us from every rocky look-out, we could nowhere catch sight of him. An inexperienced traveller would have imagined that there had been a general exodus, and that the whole race had disappeared—had gone to the Tonto basin, or the Gila, or some remote hiding-place.

If he wanted to have this mistake corrected, he should have done as we did: he should have gone down into a cañon and travelled along its bed for a few miles, until he had reached a place where you can look up on either side and not discover the remotest chance of getting out—where ahead, and in the rear, as far as you can see, it looks like a deep grey coffin. Then suddenly he would hear a war-whoop that would make him think that all the savages in the Rocky Mountains, from Fort Bridger to Apache Pass, were within bow-and-arrow range.

A week or two ago, on an occasion very similar to the above, General Gregg was with me. We were hunting for a route from the Val de Chino, eastward to the Colorado Chiquito, by crossing the head-waters of the streams flowing into the Rio Verde close up to where they emerged from the high rocky wall at the base of the San Francisco Mountains, when we came to the cañon of Sycamore Fork. We succeeded in descending the gorge; but the ascent was so exceedingly steep, that we thought the pack-train could not climb up out of it; and concluded, in spite of its violating the fundamental rule of Indian warfare in these mountains, to return to the bed of the cañon and follow it to its mouth.

It was strewn with fragments of red sandstone, from the size of a church to that of a pebble, over which we dragged our foot-sore animals very slowly. We had made some eight

miles when, as it seemed, at the roughest part of the whole way, where nature had made a sort of waste closet at random for all the shapeless blocks and sharp-cornered masses of rock and washed-out boulders that she had no time to work up and wished to hide from sight, we suddenly heard a shot from the brink of the cañon at our rear, and the dreaded war-whoop burst upon us. Then we looked up to the right and left, ahead and to the rear; but the walls seemed everywhere as tall as a church-steeple, with scarcely a foot-hold from top to base. They had looked high before, and the chasm narrow, but now it seemed as though we were looking up from the bottom of a deep well or a tin-mine, and no bucket to draw us up by. Soon the shots were repeated, and the yells were followed by showers of arrows. We staggered and stumbled, about as fast as a very slow ox-team, along the rocky bed, till we came to some bushes, and then stopped.

Some of the Indians had got on the edge of the cañon ahead of us, whose yells answered those from the rear; and the whole concatenation of sounds echoed among the cliffs till it seemed to us that every rancheria in Arizona had poured out its dusky warriors to overwhelm us.

It was a yell of triumph—of confidence. It appeared to say, "Oh, ye wise and boastful white men, with your drilled soldiers and repeating guns, and wealth and power, who came out to hunt the poor Indian from his wigwam, look where we have got you! We have only been waiting for you to make some blunder; now we shall take advantage of it, and not let any of you escape. It shall be worse than at Fort Kearney, for not even *one* shall be spared to tell the story. It will be a good place to bury you; in fact, you are already buried in as deep a grave as you could wish. We shall only leave you there, that is all, ha! ha! What are your Spencer

carbines worth, and your soldiers with their fine uniforms and drill? It is only the old lesson we are teaching you: our forefathers taught it to Braddock, and it has been repeated many times since; but we shall drive it into you deeper than ever it has been before, ha! ha! You thought we had all gone, but our eyes were never off you; and now we are gathering our warriors from every hiding-place. This is the way we call them out—whoop! whoop! whoop! and they are lining the edge of the cañon before and behind you. You can take your time. It is only ten miles to the mouth; and the farther you go, the deeper the cañons get. Perhaps you wish to retreat? It is only eight miles back, and you know what sort of a path it is. From the cedars on the brink we will pick you off at our leisure, and you shall not see one of us. This country belongs to us—the whole of it; and we do not want your people here, nor your soldiers, nor your railroad. Get away to where you belong—if you can, ha! ha!"

It was not all this in detail, but the sum and concentration of it, that flashed through my mind as I listened to those yells, now rising clear and wild on the breeze, and now dying away in the distance.

We moved close up to the foot of the wall, from the top of which the shots came, thinking it would be too steep for them to hit us; but the great rocks that came rolling down upon us, resounding almost like heavy ordnance through the cañon, drove us away from that slight shelter. Here was a new danger, and a very serious one, since there was no hope that this kind of ammunition would give out, and the Indians evidently knew how to use it.

"Now, officers, be quick and sharp in giving your orders! Throw away precedent and drill, and come down to native common-sense!" "Now, soldiers, be prompt, and jump at the

word of command, and don't get disheartened! And you, muleteers; scatter out your animals, keep them sheltered as much as possible, and avoid all disorder. Now, everybody keep cool, for every man's life hangs upon a single movement here; and if a panic breaks out, all is lost, and the latest tragedy in the great Apache war, which they say has been waging against the Spaniards and Americans for over two hundred years, will have been enacted!" Soon the sharp, clear voice of the adjutant rang out from behind a huge rock in the channel, his carbine at a "ready," and without moving his eyes from the cliff—"Sergeant, send six men to scale that side of the cañon!"

As they moved out, General Gregg joined them and directed their movement.

I gave the next order to the little escort I had brought from New Mexico: "Sergeant Miller, station five men on this side of the cañon to cover that scaling party with their fire. Let them take shelter behind the rocks." This was done, and the devoted little band began slowly to ascend what seemed an almost vertical wall of sandstone.

Until now, although the yells had rung all around us, the firing was confined to the west side of the cañon, but at this moment a very close shot was fired from the other side, and our plans could not be carried out unless this was stopped. Another scaling party of six men was accordingly detailed, of which I took command, and began ascending the eastern cliff, covered by the fire of a second small party in the cañon. This disposed of all our fighting force, the remainder being required to take care of the animals. How we got up, God knows; I only remember hearing a volley from below, shots from above, Indian yells on all sides, the grating roar of tumbling boulders as they fell, and the confused echoing of

calls and shouts from the cañon. Exhausted, out of breath, and wet with perspiration, boots nearly torn off, and hands cut and bleeding, I sat down on the summit and looked around. Across the narrow chasm I saw the other scaling party. Everything was as quiet as death, the Indians had disappeared—melting away as suddenly and mysteriously as they had at first appeared. They had gone to their hidden lairs, cowed by our determined approach.

It had been hurriedly arranged before we ascended, that the scaling parties should move on down stream at the brink of the cañon, covering the pack-train and animals which would march along the bed. Accordingly we moved on towards the Rio Verde; but, in consequence of side cañons, were compelled to keep back at least half-a-mile nearer to the foot of the mountain than the course of the cañon.

Six miles farther, while skirting a ridge which projected from the mountain, the Indians from the top began yelling again like demons, and firing at us, but the range was too long to do any harm. They were too cowardly to attack even our small party, and now that we were no longer engulfed in a cañon, we laughed at their whoops. They followed us, however, hoping to catch us in a ravine, but we always sent three men across first to cover the rest and be covered by them in turn.

Just as the sun was setting we recognised from a high point the mouth of the Sycamore and the valley of the Rio Verde. We had not been able, from the roughness of the country, to approach the side of the cañon in which we supposed the rest of the party were moving, and could not, therefore, ascertain their whereabouts. But at last, towards dark, we descended a second time, by a deep side gorge, into the cañon, dropping down fully 2,000 feet in the space of

half an hour. It was just light enough when we reached the bed of the main cañon to discover that our party had not passed down it, and although fearful lest the Apaches should notice our descent and again pepper us in the narrow ravine, we turned up it to meet them.

That night's march up the cañon, over the broken rocks and through the tangled thickets, was worse, if anything, than the attack. Every pebble in the darkness was magnified to a boulder, and every boulder seemed as large as a house; fording the rapid stream twenty times, we shivered with cold and wet when we halted for a brief rest; expecting every moment to meet our party encamped, we yet wondered how they would dare to stop in such a place. Finally, near midnight, we halted under some sheltering rocks, and concluded to take some sleep; but the guides protested against having a fire, saying the Indians would detect and shoot into it. To sleep without one, however, was impossible. At last I concluded that it was better to die from an Indian arrow than to freeze to death in the darkness, and ordered a small one to be lighted, beside which we sat and slept and shivered until a little before day-light, when we took another smoke for breakfast and pushed out into the darkness to continue our march up the stream.

During the night a great rock had either become dislodged or had been rolled down by Indians, but it fell into the cañon with a report like thunder. I started up and found I had not dreamt it. I would give something to have a faithful picture of that little party, with the expression of each as they stood or leaned, staring out into the pitch-dark cañon and wondering what would come next.

By day-break we had got well on our way; when we heard shots in the rear, which we presumed to be Indians

firing into our abandoned camp. We commended ourselves for early rising and pushed on, wondering what could have become of General Gregg's party. Finally, the guides insisted on getting out of the cañon and striking towards Prescott, but I ordered them to keep a-head, feeling confident that we should soon meet the party or its trail.

At last all hope seemed to be gone, and I agreed to climb out up the western cliff. It was as much as we could do to reach the top, and imagine our feelings on arriving there to find that we were merely on a vertical ledge of rock, and that immediately on the other side was the same cañon we had come along an hour before. We scrambled along the narrow ledge, however, faint from hunger and fatigue, having come nearly twenty miles on foot, up and down cañons and steep ravines, climbing through mountain passes and stumbling over the rocky bed of the streams—equivalent to at least sixty miles, as we thought, on a level road. We had had nothing to eat for over twenty-four hours, and very little sleep; the night was bitterly cold, our over-coats were left behind when we scaled the cliff during the Indian attack, and we had nothing to comfort us but a "Tucson blanket" each, which scant covering can scarcely be interpreted in genteel society.

Such was our condition when one of the party cried out, "What is that smoke?" I got out my field-glass and saw two fires, and some animals grazing contentedly on a distant hill. "That is camp, boys! Orderly, fire two shots in quick succession!" The shots were fired. Anxiously we listened for the acknowledgment. It came soon—the two welcome answering shots, and we strode on with renewed heart.

Now if we had not seen camp, I could have walked as many miles as we had already gone without giving up, but when I came within two miles of camp, and felt certain of succour,

and could talk with General Gregg across a deep cañon, only half-a-mile distant, my legs, somehow or other, refused to carry me farther, and I came to the conclusion that infantry service was disagreeable on an empty stomach. So I made a fire and laid down to sleep, and sent for rations, which my faithful servant, George, brought out to me in the rain, with a flask of whiskey from General Gregg, and strict injunctions to be sure to drink it all—a command I promptly obeyed. I hope the Temperance Society will forgive me, as I could have drunk a demijohn under the circumstances without being affected by it.

It was by no means a short walk even from where we were to General Gregg's camp, as we had to head the deep side cañon, and to cross several others near their sources. It was raining, and the ground and rocks were slippery; but at last we arrived and received the gratulations of the party, who had heard the Indian shots and shouts, and feared we had met too many of the "noble reds."

General Gregg had found a way out of the Sycamore Cañon along a horrible trail, by unloading his pack mules and making several trips of it. He had signalled to us, but had no means of communication, and supposed we had struck for Camp Lincoln, a military post in the valley of the Verde fifty miles to the south.

My noble grey horse, Signor, is gone. He had helped to carry me faithfully from Santa Fé through New Mexico, and thus far into Arizona, but he has fallen a martyr to the topography of the sources of the Rio Verde. While George was leading him up a precipitous path he lost his footing in jumping over a rock, and tumbled to the bottom of the cañon, 100 feet, killing himself instantly. My other valuable horse, Don, whom I intend to take home if I get him safely

to the Pacific, had just scrambled over the same obstruction without stumbling. It was nothing less than a miracle that nobody was hurt. These Indians are poor shots, which, with the scarcity of guns among them, must account for our escape. They are afraid also of our "heap-firing guns" as they call the Spencers.

A little experience of this sort, occasionally, is not without use. It enables you to determine a number of nice problems which otherwise might never have been solved, to say nothing of the new phases in which it exhibits the character of your comrades; the test of their true-heartedness, their pluck, perseverance, and generosity. There are also some important minor questions to which it supplies accurate solutions. For instance, how would a man ever know whether a smooth boulder of lava or a flat sandstone slab would make the best pillow, until such occasions had induced him to test the matter practically at frequent intervals during the same night? And how could he ever ascertain the durability of a pair of Santa Fé boots under active service, until a trial of this kind had placed it forcibly before his observation? And while he might hitherto have had a theoretical appreciation of the value and excellence of a slice of fat pork with "hard tack" for dessert, it is doubtful whether he would ever comprehend the essential sweetness and delicacy of these dishes until, after twenty-four hours' fasting, he had watched with a field-glass across a cañon until they should start out towards him from a camp two miles distant.

We have given the question of evading the side of San Francisco Mountain with our railroad line a pretty thorough investigation, and are at last compelled to give it up. First, I tried to head the Sycamore and other northern branches of

the Verde, and to cross the country on a somewhat uniform level between 5,000 to 6,000 feet above tide, from the Colorado Chiquito to the Val de Chino. Second, to keep down the valley of the Verde itself; but the crooked cañons prevented this. Third, to keep along the foot-hills of Tonto Mountain overlooking the Verde from the south and west side. Fourth, to cross the Tonto Mountain and descend into the Verde at Copper Cañon, near Camp Lincoln, then to re-ascend east of the Mogollon Range and cross it to the Colorado Chiquito. But the valley of the Verde is an immense gulf, from 1,000 to 2,500 feet below the level of the mountains, or rather plateaux east and west on either side. Finally, within the last few days the profile of the line crossing the Mogollon Range, south of San Francisco Mountain, has pretty nearly satisfied me that there would not, after all, be much to gain by a southern route, especially if our line can descend to the Great Colorado in the vicinity of Fort Mojave, instead of by the Bill Williams Fort, of which I have hopes. My reconnoissance has settled some important questions of route, concerning which we should always have been in doubt, and Greenwood has continued his survey across the side of San Francisco Mountain without being delayed a day, using all three of his parties. The grades up to this place are easy, and the line runs for nearly 150 miles through a dense forest of fine tall pines, which will of themselves be a great advantage to the railroad in many ways.

* * * * * *

CHAPTER XII.

CENTRAL ARIZONA.

Hinchman lost for four days.—General Features of the Country west of the San Francisco Peaks.—Val de Chino.—Upper Valley of the Rio Verde.—Ruins everywhere.—Lower Valley of the Verde—Country around Prescott.—Valley of the Colorado.—Mineral Wealth.—Mogollon Ranges.—Mining Districts around Prescott.—Wickenburgh District.—La Paz District.—The Salt Mountains.—The Great Basin Region.—Difficulties of the Surveyors.—Tehachapa Pass.—Mining in California.—Yield of Precious Metals.

NOTWITHSTANDING the bonfires which were kept blazing all night above Signal Cañon, Hinchman did not return. Next morning they searched for him in all directions, but in vain. Fearing that he had fallen into the hands of the Apaches, they redoubled their exertions, and continued the search for three days, but still without success; and at last Palmer had to give it up and return to Prescott, persuaded that one of the greatest favourites of our whole party had fallen a victim to the cause. Hinchman, however, was intended by Providence for better things than to furnish a scalp and a night's amusement to the red-skins. He had lost his way, and, becoming confused in the intricacies of the cañon country, thought it best to make his way as well as he could to Prescott, where he arrived on the fourth day, thoroughly exhausted, not having tasted food during all that time.

After leaving the San Francisco Mountains to the eastward, the line by the 35th parallel enters a region not so well watered or timbered, but equally good for grazing purposes.

"The Val de Chino, which we now enter," says General

Palmer, "is a splendid meadow, ten miles in width, lying between the Aztec Range and Black Mountains on the south and west, and the Laja Range, Black Forest, and Tonto Buttes on the east and north. It extends south-eastward beyond the line of Prescott, and northward to within twenty miles of the Grand Cañon of the Colorado. This distance is considerably over 100 miles.

"Throughout it is covered with the finest grama grass, which gives the name to the valley. The soil is rich, and only needs water to enable the breadstuffs of an entire State to be raised here. Whipple thought irrigation might no more be necessary here than in the Zuñi valley; but it is impossible to try the experiment, as the Wallapi Indians infest the country.

"The average elevation of this great valley is about 4,500 feet above tide. Tributary to it are various small but rich mountain valleys, in some of which ranches have been started. Such are Pueblo and Walnut Creek, Turkey Creek, Partridge Creek, Round Valley, Williamson's Valley, Granite Creek, &c., most of which, in the rainy season and when the snows melt, pour down large volumes of water into the main valley. The Val de Chino is the proper head of the Rio Verde, along which, north and east of Prescott, lies much rich irrigable land in the open valleys between the numerous impassable cañons of this stream. The 'upper valley of the Verde,' which I visited, is about forty-five miles long, and an average of five miles in width. The soil is rich, water permanent (without alkali), and sufficient for all purposes of irrigation, the elevation being only 3,000 to 3,500 feet above tide. Snow is unknown; and the valley having a deep sandy soil, is richer than the valley of the Rio Grande; it is mixed, like the latter, with the detritus of lava deposits, and, being

admirably sheltered by mountain-walls on each side 1,200 to 2,400 feet high, is especially adapted to the production of wine and fruits. Wild grapes are everywhere abundant. The few settlers near Camp Verde informed me that they had raised seventy-five bushels of maize to the acre, without irrigation; also wheat and barley. All vegetables, except potatoes, flourish in the greatest abundance.

"In this valley, even to a greater extent than in the valley of the Colorado Chiquito, on the Mogollon Range, and in the Aztec Mountains, we met constantly the broken pottery, ruined foundations of pueblos, and abandoned caves, which indicate the former existence of that populous, semi-civilised race, which, for want of a better name, are called 'Aztecs.'

"Below the upper valley, but separated from it by a rugged and tortuous cañon, is the lower valley of the Verde, twenty five miles long, and equally rich, and filled with Aztec ruins and pottery. These sheltered Verde valleys are, without doubt, well adapted for the production of cotton.

"There is much good arable country around Prescott also, and at the heads of the Agua Fria and other valleys leading southward to the Gila. Numerous ranches have been established here, and crops are raised without irrigation.

"We now descend gradually to the Rio Colorado, whose valley is wide and fertile. Whipple pronounced the soil superior to that of the Rio Grande valley. Of course the climate has much more of a tropical character, the elevation above the sea being less than 400 feet, snow being unknown, and the winter sometimes passing without any frost. Both climate and soil fit it for cotton, tobacco, hemp, castor beans, rice, and even sugar, to which products all the valley-land will, perhaps, be devoted, leaving the cereals to be brought down from the higher valleys of Arizona, or eastward from

the slopes of the Sierra Nevada and the Tulare and San Bernardino valleys of California. The Mormons raise a great deal of cotton at their settlements. On the Virgin and its tributaries, 150 miles north of Fort Mojave, they have several cotton factories in operation, and are building more. They also raise some sugar.

"At present the Mojaves, Chemenevis, and other populous tribes of Indians inhabiting the valley of the Colorado, raise corn, wheat, beans, melons, and squashes; and a large amount of hay is cut by them for Fort Mojave and the mining stock near Hardyville. Wheat ripens in April; barley harvest takes place in May. There is as yet no artificial irrigation, the valley being inundated annually by the river, which rises seventy-five feet in summer from the melting of the snows at its mountain sources. We found some stalks of fine Sea Island cotton growing here near Hardy's Mine, about 1,000 feet above the river, and melons were brought in by the Indians on Christmas week.

"From the head of navigation at Callville, for sixty miles down to Cottonwood Valley, there is no bottom-land. In this stretch occur Black Cañon and Painted Cañon. In Cottonwood Valley, which is from one to five miles in width, there are about twenty square miles of arable land, which the Mormons talk of occupying for cotton plantations. Thence the river flows for twenty-five miles through Pyramid and other lesser cañons to a point three miles above Fort Mojave, where the bottom widens out on both sides of the river, in some places to ten miles, and so continues to where our line crosses it three miles above the 'Needles.' This is the Mojave valley; it is rich in soil, and contains about 100 square miles, of which over one-half is covered with cotton-wood and mezquit trees. Below our crossing occur the

Needles, where the projecting spurs of the Mojave Mountains, which wall in the Colorado on either side, impinge for probably six to eight miles directly on the river. Then comes the Chemenevis valley, about five miles wide, and very similar to the Mojave valley. Below the mouth of Bill Williams Fork there are occasional narrows, with wide and long stretches of bottom-land, sometimes, as at La Paz, thirty miles wide. This alteration continues to Fort Yuma.

"Whipple estimated the Colorado valley to contain, from Fort Mojave, south, 1,660 square miles of arable land, without including the southern desert—that part of the Great Basin lying south of the Morongo Range—which might be rendered fertile by means of irrigation."

Before considering the mineral productions of this section of the route, I will conclude the accounts of its physical characteristics with Dr. Parry's testimony:—"In point of fact, without taking into consideration the undeveloped mineral wealth locked up in her granite mountains, central Arizona comprises as large an extent of habitable and productive country as any other section west of the agricultural basin of the Mississippi."

The Mogollon ranges, which reach as far north as the Rio Gila, are found, by the united testimony of all explorers who have dared to traverse this section of the Apache country, to be very rich in gold and other minerals. It is here that Aubrey reported having met Indians with golden bullets. "They are," said he, "of different sizes, and each Indian has a pouch of them. We saw an Indian load his gun with one large and three small gold bullets to shoot a rabbit."

None of our surveyors were fortunate enough to be able to corroborate this report; but they obtained seven or eight

bullets of native manufacture which contained a larger percentage of silver than of lead.

From the San Francisco Mountains to the Aquarius Range, seventy-five miles east of the Colorado River, the proposed line passes to the north of the ascertained and developed mineral wealth, which is abundant in that extensive section of central Arizona, of which Prescott is the mining capital. This is, however, readily reached by a branch of easy grades, sixty miles in length, which can be cheaply built down the Val de Chino; and a fork can be extended thence to the Wickenburgh mining region.

In this district the most promising mine is the Vulture, which yields about 25,000 dollars a month, and in which seventy-five men (mostly Mexicans) are employed.

The following statement will show at a glance how hard it is for even a first-class mine to pay largely in these regions whilst they remain shut out as they are from the rest of the world.

VULTURE MINE AND MILL.—MONTHLY EXPENSES.

	Dollars.
Pay roll	**9,000**
Incidentals	3,520
Hauling ore, 864 tons, at 10 dollars	8,640
Fuel	720
Interest on capital invested	875
Total monthly expenses	**22,755**

MONTHLY RETURNS.

864 tons, yielding 30 dollars per ton	25,920
Net monthly profit	**3,165**

On both sides of the Colorado River north and south of Fort Mojave are mines of gold, silver, and copper, the value of which is greatly enhanced by their proximity to this stream, which will thus serve as a most valuable feeder to the

railroad. Of these the best known are the copper mines of the Bill Williams, of which Mr. Ross Brown says—"There are fifty good mines of rich copper, black and red oxides, silicates, and carbonates, all of such a character that they can be readily smelted by heat alone. The ores average forty per cent. of metal. Many of these ores are also rich in gold, for which mills have been erected."

These mines were visited by Dr. Parry in December, who reports that they were shipping all ores of forty per cent. and over to San Francisco by an uncertain and circuitous water-channel nearly 2,500 miles long, and that the main bulk was thence transported, by way of Cape Horn, to Swansea, in Wales, for reduction. Even then they paid their possessors.

Dr. Parry also visited the mining regions in western Arizona, south of Bill Williams Mountain, of which he reports:—"At several points gold has been successfully worked, yielding, in a few instances, rich returns from the rudest processes of dry washing. Quartz veins crop out in wonderful abundance in several isolated localities; especially noted ten to fifteen miles west of La Paz, where rich deposits of silver and copper ores are also known to exist, and have been partially worked; but, in nearly every instance, mining enterprise has been forced to succumb to insurmountable difficulties, and in not a few cases to actual loss of life."

From ten to forty miles north of Callville, which is 100 miles above Fort Mojave, both being on the Colorado, are the famous Salt Mountains, where there is an inexhaustible quantity of pure rock salt very accessible to miners. At one point there is a surface exposure of seventy feet, clear as a crystal. For several miles square the formation is reported to be almost exclusively of this crystalline salt. There is a little sloop, of twenty-five tons, running from Fort Mojave to

Callville, which takes up merchandise and brings back salt, potatoes, and other produce. Aubrey reports having found rich gold placers between Fort Mojave and Callville, near the mouth of Yampa Creek.

* * * * * *

California, to the Western traveller, means civilisation; the very name implies "square meals" (*déjeûner à la fourchette?*), arm-chairs, boot-blacking, and other luxuries; but the man who enters it by crossing the Colorado at the Needles would certainly not recognise the Golden State. Two hundred and thirty-five miles of complete desert have to be passed through before he reaches the base of the Sierra Nevada. The line surveyed by our parties, after leaving the river at an elevation of only 428 feet, ascends again 2,151 feet to Piute Summit, where it enters the Great Basin and then gradually descends into a natural depression only 675 feet above the sea. From this basin—called "Perry Sink," after our botanist—it passes into the Mojave Basin, and at last reaches the foot of Tehachapa Pass, where the fertile slopes of the sierra are soon reached. Here the surveyors met agricultural settlements for the first time for many weeks, and found the mountain glades well furnished with fine timber. Their camp in one of the oak groves, which are so abundant here, forms the subject of the accompanying engraving.

The rains, which were so incessant during the month of January at San Francisco, extended with diminished force over this southern desert also, and greatly impeded the progress of the parties; when, however, they had crossed the mountains and tried to march through the central trough of California—the Tulare valley—they found themselves almost brought to a standstill. General Palmer here left them, and in company with Colonel Willis, Dr. Parry, and Captain

Vincent Brooks Day & Son lith.

TEHACHAPA PASS IN THE SIERRA NEVADA.

Colton, who had joined him from San Diego, found his way, as best he could, by horse, wagon, stage and rail, to San Francisco.

It is useless to praise the agricultural resources of California, for they are well known, or to speculate upon the most probable route for the railway through its midst; for it matters little whether it runs to the east or west of the Great Tulare Lake, whether it continues all the way in the San Joaquin valley, or crosses the coast range into the fertile plains of the Salinas. Whatever be its course it will develop vast areas of land unsurpassed in productiveness by any on the globe.

As regards mineral wealth, the southern half of the Great Basin is quite as rich in silver as the northern; and although "unexplored" covers this barren tract in our atlases, it is in reality divided into countries and mining districts, which latter are fast multiplying every year.

Most of the gold mining in California is carried on along the western foot of the Sierra Nevada, and although it does not yield the same amount as formerly, it has developed into a steady thriving industry, with no more excitement about it than any other regular occupation.

The ingenuity displayed by the Californian miners in trying to obtain the gold from the soil is extraordinary. The first arrivals used only the pan, a flat iron saucer about eighteen inches in diameter, for extracting the gold. Soon the rocker was introduced. It is shaped like a cradle with a riddle above at one end, upon which the pay dirt is placed, and transverse grooves along the bottom to catch the gold, while the miner rocks the cradle with one hand, and washes the pay dirt through the riddle with the other. For the first four years, although the pan and the rocker were alone

relied upon, most of the rich, well-watered placers were soon exhausted, and it was necessary that some means should be devised for directing water to less-favoured districts. This led to the introduction of mining ditches to carry water from the highest springs in the hills to the auriferous ground at their base. Such ditches were expensive, for the water had to be brought in "flumes" for miles across ravines 200 or 300 feet deep, along the rugged mountain-sides, and often through rock cuttings; and the capital required to make these aqueducts had usually to be borrowed at the rate of from 3 to 10 per cent. per month.

With the mining ditches came the "tom" and sluice. The tom is a trough twenty feet long and eight feet deep; it is fifteen inches wide at the head and thirty at the foot. This trough rests upon a flat box; its bottom is formed of sheet-iron pierced with holes, through which the pay dirt is washed by a constant stream of water. The gold is caught by transverse "cleets," or "riffles," which rise from the bottom of the box, and all the pay dirt which passes over the tom undecomposed is again thrown back, to go through the same process again. The sluice is the box of the tom in principle, elongated to any length from 100 to 1,000 feet; it has transverse cleets along its whole length, to catch the gold, and is placed at an inclination of one in twenty, so as to cause the water to rush through it like a torrent. This was a great invention, for twenty miners could work at one sluice together, and, with plenty of water, they had nothing to do but to throw in the pay dirt and take out the gold. If many sluices discharged into one stream or ditch, a tail sluice was often dug in the ground to catch the gold which had escaped from the sluices, and this tail sluice often paid largely, with no labour save that required to "clear up" occasion-

ally, that is, to wash out the metal from the sand at the bottom.

By the end of the year 1852 the surface placers were nearly exhausted, good sluice claims were at a high premium, and there was not work enough for one-third of the miners. Large amounts of capital were required for the ditch companies, and almost as much for the sluices.

In this predicament, the attention of the American miners was suddenly directed to quartz mining. The Mexicans had worked quartz veins for a long time by pounding the ore in mortars, or grinding it in their rude arrastras, and extracting the fine gold-dust by means of quicksilver. The Americans immediately introduced stamp mills, and their ideas were so large that the most bulky and elaborate machinery was soon in operation; companies with large capital were rapidly formed; many hands were employed; quartz was crushed in enormous quantities in a great number of places, whether it was rich or poor, and complete failure was consequently the result in the great majority of cases. A stamp mill has already been explained and figured in chap. xii., vol. i.

The first attempt at quartz mining having proved unsuccessful, the miners tried to invent a process by which the gold could be cheaply extracted from large quantities of land which contained only a small percentage. This led to the hydraulic process. With "poor dirt" to work up, the shovel did not furnish earth enough for the sluice, and the wages of twelve out of twenty men must, if possible, be saved. As early as 1852, a man named Mattison, of Connecticut, invented an hydraulic machine, by means of which a stream of water could be directed, under heavy pressure, against a bank or hill-side, containing placer gold, and the earth torn down by the action of the jet of water and carried

into the sluice to be washed, thus saving the expense of shovelling.

It was long before this process made much way in California; but at present it is in general use, and pays largely. Its advantages are enormous. A man with a rocker, for instance, can wash out one cubic yard of earth in a day; with

Hydraulic Mining.

a tom, two; with a sluice, four; and, with an hydraulic squirt and sluice together, fifty, or even a hundred. A stream of water rushing through a two-inch pipe, under pressure of 200 feet perpendicular, has tremendous force, and the hill-sides crumble away before it as if they were made of sawdust.

In the engraving, the water-pipes, the hydraulic squirt, and the sluice are clearly shown. The two former are usually owned by a water-company, which supplies the water to the miners at so much a thousand cubic feet. Hundreds of miles of iron pipes now ramify through the mountains in every direction; and even their transportation to these remote regions represents an enormous amount of capital.

This powerful agent has changed the whole face of nature in a hundred districts along the base of the mountains. I have seen valleys obliterated, hills levelled to the ground, rivers turned from their course and fertile tracts of country covered with bare heaps of gravel miles in extent. It is an extraordinary sight to pass through a region which has for some time been subjected to the hydraulic process. A Californian might well return from a year's travel in Europe, and find, like Rip Van Winkle, that everything had so changed in his absence that not a hill remained standing where he had left it.

Notwithstanding all the varied and ingenious appliances which the Americans have introduced, the yearly production of gold in California has steadily been on the decrease, whilst the exportation of precious metal has, owing to the productiveness of other territories, been as steadily advancing.

Since 1848, the Western States and Territories have produced no less than £250,000,000 sterling of precious metals, and they continue to yield yearly about £15,000,000 more. Mexico produced in the three hundred years previous to 1845 about £540,000,000. Since then the annual yield has probably not exceeded £5,000,000; so that, although the total yield up to 1867 would be about £600,000,000, the United States will probably exceed that sum before the end of the present century.

Whilst General Palmer, Dr. Parry, and Major Calhou were examining the natural productions of the country, and the surveyors were hard at work trying to find a level route across the regions which lie about 100 miles south of the Great Cañon of the Colorado, an unfortunate prospector was actually floating through that stupendous chasm on a simple raft of cotton-wood. Dr. Parry had the good fortune to meet this man, after his perilous trip, at Hardyville, on the Rio Colorado, and to hear from his own lips the story of his adventure. The doctor carefully noted all the particulars of the story, and closely cross-questioned the hero of it, who, although a simple and illiterate man, was brave, straightforward, and one to be thoroughly believed. Major Calhoun, who had appointed to meet him at Fort Mojave, but was prevented from doing so, has kindly compiled for me the following account from the notes taken by Dr. Parry, and is thus the writer of one of the most tragic pages to be met with in the histories of actual adventure.

CHAPTER XIII.

PASSAGE OF THE GREAT CAÑON OF THE COLORADO BY JAMES WHITE, THE PROSPECTOR.

TWENTY years ago the trapper and hunter were the romantic characters of the Far West. They still figure in fiction, and there is a fascination about their daring deeds which, in America, makes Boone a household name, and throws an air of chivalry, seldom to be felt now-a-day, around the exploits of such men as Carson, Crockett, and Williams. Nor is our admiration for these hardy men undeserved; they have trapped on every Western stream, and hunted on every mountain-side, despite the opposition of the Indian and the barrier of winter snows. They have been the skirmish line of that great army of occupation which is daily pushing westward, and they have taught the savage to respect the white man's courage and to fear the white man's power.

While the field for the trapper and hunter has been gradually growing less, another class of adventurers has come into existence—the "prospectors" in search of precious metals. Within the last nineteen years these men have traversed every mountain slope, from the rugged peaks of British Columbia to the rich plateaux of old Mexico; and have searched the sands of every stream from the Mississippi to the shores of the Pacific, stimulated by the same hope of

reward that led the early Spaniards to explore places, still unsettled, in their search for an "El Dorado." Could the varied and adventurous experience of these searchers for gold be written we should have a record of daring and peril that no fiction could approach, and the very sight of gold would suggest to our minds some scene of startling tragedy, some story of hair-breadth escape. Could we but gather and set down in proper form the geographical knowledge possessed by these men, we should know as much of the western wilds as we now do of the long-settled portions of the American continent.

It has fallen to the lot of one of these prospectors to be the hero of an adventure more thrilling than any heretofore recorded, while, at the same time, he has solved a geographical problem which has long attracted the attention of the learned at home and abroad, who could but theorise before his voyage as to the stupendous chasms or cañons through which the Colorado cleaves its course.

James White, our hero, now lives at Calville, Arizona Territory, the present head of navigation on the Colorado River. His home is in Kenosha, Wisconsin. He is thirty-two years of age, and in person is a good type of the Saxon; being of medium height and heavy build, with light hair and blue eyes. He is a man of average intelligence, simple and unassuming in his manner and address, and without any of the swagger or bravado peculiar to the majority of frontier men. Like thousands of our own young men, well enough off at home, he grew weary of the slow but certain method of earning his bread by regular employment at a stated salary. He had heard of men leaping into wealth at a single bound in the Western gold-fields, and for years he yearned to go to the land where fortune was so lavish of her favours.

He readily consented then to be one of a party from his neighbourhood who, in the spring of 1867, started for the plains and the gold-fields beyond. When they left Fort Dodger, on the Arkansas River, April 13th, 1867, the party consisted of four men, of whom Captain Baker, an old miner and ex-officer in the Confederate army, was the acknowledged leader. The destination of this little party was the San Juan valley west of the Rocky Mountains, about the gold-fields of which prospectors spoke in the most extravagant terms, stating that they were only deterred from working the rich placers of the San Juan by fear of the Indians. Baker and his companions reached Colorado "city," at the foot of Pike's Peak, lat. 38°, in safety. This place was, and is still, the depôt for supplying the miners who work the diggings scattered through South Park, and is the more important for being situated at the entrance of Ute Pass, through which there is a wagon-road crossing the Rocky Mountains, and descending to the plateau beyond. The people of Colorado "city" tried to dissuade Baker from what they considered a rash project, but he was determined to carry out the original plan. These representations, however, affected one of the men so much that he left the party, and the others, Captain Baker, James White, and Henry Strole, completed their outfit for their prospecting tour.

The journey was undertaken on foot, with two pack mules to carry the provisions, mining tools, and the blankets they considered necessary for the expedition. On the 25th of May they left Colorado "city," and crossing the Rocky Mountains, through the Ute Pass, they entered South Park, being still on the Atlantic slope of the continent. Ninety miles brought them across the Park to the Upper Arkansas, near the Twin Lakes. They then crossed the Snowy Range, or Sierra

Madre, and descended towards the Pacific. Turning south-west, they passed around the head-waters of the Rio Grand del Norte, and after a journey of 400 miles, they reached in safety the Animas, the most northern branch of the San Juan River, which flows into the Great Colorado from the east.

They were now in the land where their hopes centred, and to reach which they had crossed plains and mountains, and forded rapid streams, leaving the nearest abodes of the white man hundreds of miles to the east. Their prospecting for gold began in the bed of the Animas, and though they were partially successful, the result did not by any means reach their expectations; so they followed down the stream into the main valley of the San Juan. There was gold there, but not in the quantity they expected; so they gradually moved west, along the beautiful valley, for 200 miles, when they found that the San Juan entered a deep and gloomy cañon. To avoid this they forded the river to the right bank, and struck across a rough timbered country, directing their course towards the Great Colorado.

Having travelled through this rough country for a distance estimated at fifty miles, they reached Grand River, being still above the junction of Green River, the united waters of which two streams form the Colorado proper. At the point where they struck the river it was hemmed in by cliffs of perpendicular rock, down which they could gaze at the coveted water, dashing and foaming two thousand feet below. Men and animals were suffering for water, so they pushed up the stream along the rocky uneven cañon wall, hoping to find a place where they could descend to the river. After a day spent in clambering over and around the huge rocks that blocked their way, they came upon a side cañon, which they succeeded in descending with their animals, and where

they obtained the water of which all stood so much in need.

On the night of the 23rd of August they encamped at the bottom of the cañon, where they found plenty of fuel, and grass in abundance for their animals. As they sat around the camp fire they lamented their failure in the San Juan country, and Strole began to regret that they had undertaken the expedition. But Baker, who was a brave, sanguine fellow, spoke of *placers* up the river about which he had heard, and promised his companions that all their hopes should be realised, and that they should return to their homes to enjoy the gains and laugh at the trials of their trip. So glowingly did he picture the future, that his companions even speculated as to how they should spend their princely fortunes when they returned to the States. Baker sang songs of home and hope, and the others lent their voices to the chorus till, far into the night, they sank to sleep unguarded, to dream of coming opulence, and to rise refreshed for the morrow's journey.

Early next morning they breakfasted, and began the ascent of the side cañon up the opposite bank to that by which they had entered it. Baker was in the advance with his rifle slung at his back, gaily springing up the rocks towards the table-land above. Behind him came White; Strole, with the mules, brought up the rear. Nothing disturbed the stillness of the beautiful summer morning but the tramping of the mules and the short heavy breathing of the climbers. They had ascended but half the distance to the top, when stopping for a moment to rest, suddenly the war-whoop of a band of savages rang out, sounding as if every rock had a demon's voice. Simultaneously with the first whoop a shower of arrows and bullets was poured into the little party. With

the first fire Baker fell against a rock, but, rallying for a moment, he unslung his carbine and fired at the Indians, who now began to show themselves in large numbers, and then, with the blood flowing from his mouth, he fell to the ground. White, firing at the Indians as he advanced and followed by Strole, hurried to the aid of his wounded leader. Baker, with an effort, turned to his comrades and said with his last breath, "Back, boys, back! save yourselves; I am dying." To the credit of White and Strole be it said, they faced the savages and fought till the last tremor of the powerful frame told them that Baker was dead.

Then slowly they began to retreat, followed by the exultant Indians, who, stopping to strip and mutilate the dead body in their path, gave the white men a chance to secure their animals, and retrace their steps into the side cañon, beyond the immediate reach of the Indians' arrows. Here they held a hurried consultation. To the east, for 300 miles, stretched an uninhabited country, over which, if they attempted to escape in that direction, the Indians, like bloodhounds, would follow their track. North, south, and west, was the Colorado with its tributaries, all flowing through deep chasms across which it would be impossible for men or animals to travel. Their deliberations were necessarily short, and resulted in a decision to abandon the animals—first securing their arms, a small stock of provisions, and the ropes or lariots of the mules. Through the descending side cañon they travelled due west for four hours, and emerged at last on a low strip of bottom-land on Grand River, above which, for 2,000 feet on either bank, the cold grey walls rose to block their path, leaving to them but one avenue for escape—the dashing current of the river.

They found considerable quantities of drift-wood along the

banks, from which they collected enough to enable them to construct a raft capable of floating themselves, with their arms and provisions. This raft consisted of three sticks of cotton-wood, about ten feet in length and eight inches in diameter, lashed firmly together with their lariots. Procuring two stout poles with which to guide the raft, and fastening the bag of provisions to the logs, they waited for midnight to come with the waning moon, so as to drift off unnoticed by the Indians. They did not consider that even the sun looked down into that chasm for but one short hour in the twenty-four, and then left it to the angry waters and blackening shadows; and that the faint moonlight reaching the bottom of the cañon would hardly serve to reveal the horror of their situation. Midnight came, as they thought, by the measurement of the dark, dreary hours; when, seizing the poles, they untied the rope that held the raft, and, tossed about by the current, they rushed through the yawning cañon on their adventurous voyage to an unknown landing. Through the long night they clung to the raft as it dashed against half-concealed rocks, or whirled about like a plaything in some eddy, whose white foam was perceptible even in the blackness.

They prayed for the daylight, which came at last, and with it a smoother current and less rugged banks, though the cañon walls appeared to have increased in height. Early in the morning (August 25th) they found a spot where they could make a landing, and went ashore. After eating a little of their water-soaked provisions, they returned and strengthened their raft by the addition of some light pieces of cedar, which had been lodged in clefts of the rocks by recent floods. White estimates the width of the river where they landed at 200 yards, and the current at three miles per hour. After a short stay at this place they again embarked, and during the rest of

the day they had no difficulty in avoiding the rocks and whirlpools that met them at every bend of the river.

In the afternoon, and after having floated over a distance estimated at thirty miles from the point of starting, they reached the mouth of Green River, or rather where the Green and the Grand unite to form the Colorado proper. Here the cañons of both streams form one of but little greater width, but far surpassing either in the height and grandeur of its walls. At the junction, the walls were estimated at 4,000 feet in height. Detached pinnacles appeared to rise, one above the other, for 1,000 feet higher, from amidst huge masses of rock, confusedly piled, like grand monuments to commemorate this "meeting of the waters." The fugitives felt the sublimity of the scene, and in contemplating its stupendous and unearthly grandeur, they forgot for the time their own sorrows.

The night of the day upon which they entered the Great Cañon, and indeed on nearly all the subsequent nights of the voyage, the raft was fastened to a loose rock, or hauled up on some strip of bottom-land, where they rested till daylight next morning.

As they floated down the cañon the grey sandstone walls increased in height; the lower portion was smooth from the action of floods, but the perpendicular wall-rock above became more and more rugged, until the far-off sky appeared to rest upon a fringe of pinnacles on either side. Here and there a stunted cedar clung to the cliff-side 2,000 feet overhead, or a prickly cactus tried to suck sustenance from the bare rock. No living thing in sight beyond the raft, for even the wing of bird which could pass the chasms in the upper world never fanned the dark air in those subterranean depths. Nought to gaze on but their own pale faces and the cold grey walls

that hemmed them in, and mocked at their escape. Here and there the raft shot past side cañons, black and forbidding, like cells set in the walls of a mighty prison.

Baker had informed his comrades as to the geography of the country, and while floating down they remembered that Calville was at the mouth of the cañon, which could not be far off; "such wonderful walls could not last." Then hope came with the promise of escape. A few days would take them to Calville; their provisions could be made to last for five. So these two men, thus shut *in* from the world, buried, as it were, in the very bowels of the earth, in the midst of a great unknown desert, began to console themselves, and even to jest at their situation.

Forty miles below their entrance into the cañon of the Colorado, they reached the mouth of the San Juan River. They attempted to enter it, but its swift current cast them back. The perpendicular walls, high as those of the Colorado, with the water flowing from bank to bank, forbade their abandoning their raft to attempt escape in that direction. So they floated away. At every bend of the river it seemed as if they were descending deeper into the earth, and that the walls were coming closer together above them, shutting out the narrow belt of sky, thickening the black shadows, and redoubling the echoes that went up from the foaming waters.

Four days had elapsed since they embarked on the frail raft; it was now August 28th. So far they had been constantly wet, but the water was comparatively warm, and the current more regular than they could have expected. Strole had taken upon himself to steer the raft, and, against the advice of White, he often set one end of the pole against the bank or some opposing rock, and then leaned with the other end against his shoulder, to push the raft away. As

yet they had seen no natural bridge spanning the chasm above them, nor had fall or cataract prevented their safe advance. About three o'clock on the afternoon of the 28th, they heard the deep roar as of a waterfall in front of them. They felt the raft agitated, then whirled along with frightful rapidity towards a wall that seemed to bar all farther progress. As they approached the cliff, the river made a sharp bend, around which the raft swept, disclosing to them, in a long vista, the water lashed into foam, as it poured through a narrow precipitous gorge, caused by huge masses of rock detached from the main wall. There was no time to think. The logs strained as if they would break their fastenings. The waves dashed around the men, and the raft was buried in the seething waters. White clung to the logs with the grip of death. His comrade stood up for an instant with the pole in his hands, as if to guide the raft from the rocks against which it was plunging; but he had scarcely straightened, before the raft seemed to leap down a chasm, and, amid the deafening roar of waters, White heard a shriek that thrilled him to the heart, and looking round he saw, through the mist and spray, the form of his comrade tossed for an instant on the water, then sinking out of sight in the whirlpool.

White still clung to the logs, and it was only when the raft seemed to be floating smoothly, and the sound of the rapids was left behind, that he dared to look up; then it was to find himself alone, the provisions lost, and the lengthening shadows warning him of the approaching night. A feeling of despair seized him, and clasping his hands he prayed for the death he was fleeing from. He was made cognizant of more immediate danger by the shaking of his raft, the logs were separating; then he worked, and succeeded in effecting a landing near some flat rocks, where he made his raft fast

Vincent Brooks Day & Son Lith

THE GREAT CAÑON OF THE COLORADO.

for the night. After this he sat down, to spend the long gloomy hours in contemplating the horror of his situation, and the small chance for completing the adventurous voyage he had undertaken. He blamed himself for not having fought the Indians till he had fallen with Baker. He might have escaped through the San Juan valley and the mountains beyond to the settlements. Had he done so, he would have returned to his home, and rested satisfied with his experience as a prospector. And when he thought of "home," it called up the strongest inducements for life, and he resolved, to use his own words, "to die hard, and like a man."

Gradually the dawn, long perceptible in the upper world, began to creep down the black cañon, and gave him light to strengthen his raft, and launch it again into the treacherous river. As he floated down he remembered the sad fate of Strole, and took the precaution to lash himself firmly to the raft, so as to preclude the possibility of his being separated from it. This forethought subsequently saved his life. His course through the cañon was now over a succession of rapids, blocked up by masses of rock, over which his frail raft thumped and whirled, at times wholly submerged in the foaming water. At one of these rapids, in the distance of about a hundred yards, he thinks the river must have fallen between thirty and forty feet. In going over this place the logs composing the raft became separated at the upper end, and, spreading out like a fan, White was thrown into the water. He struggled to the side by means of his rope, and with a desperate strength held the logs together till they floated into calmer water, when he succeeded in refastening them.

White's trials were not yet at an end, and in relating the following incident he showed the only sign of emotion exhibited during his long series of answers.

About four miles below where the raft separated he reache the mouth of a large stream, which he afterwards learned wa the Colorado Chiquito. The cañon through which it ente the main river is very much like that of the San Juan, an though it does not discharge so large a body of water, th current is much more rapid, and sweeps across the Grea Colorado, causing, in a black chasm on the opposite bank, large and dangerous whirlpool. White saw this and tried t avoid it, but he was too weak for the task. His raft, born by the current of the Colorado proper, rushed down wit such force, that aided by his paddle he hoped to pass th waters that appeared to sweep at right angles across hi course from the Chiquito. When he reached the mouth the latter stream the raft suddenly stopped, and swingin round for an instant as if balanced on a point, it yielded t the current of the Chiquito and was swept into the whirlpoo

White felt now that all further exertion was useless, an dropping his paddle, he clasped his hands and fell upon th raft. He heard the gurgling waters around him, and ever moment he felt that he must be plunged into the boilin vortex. He waited with his eyes closed for some minutes when, feeling a strange swinging sensation, he opened them and found that he was circling round the whirlpool, some times close to the vortex, and at others thrown back by som invisible cause to the outer edge only to whirl again toward the centre. Thus borne by the circling waters he looke up, up, up, through the mighty chasm that seemed bend ing over him as if about to fall and crush him. He saw in the blue belt of sky which hung above him like an etherea river the red tinged clouds floating, and knew that the sun was setting in the upper world. Still around the whirlpoo the raft swung, like a circular pendulum measuring the long

moments before expected death. He felt a dizzy sensation, and thinks he must have fainted; he knows he was unconscious for a time, for when again he looked up between the walls, whose rugged summits towered 5,000 feet above him; the red clouds had changed to black, and the heavy shadows of night had crept down the cañon.

Then, for the first time, he remembered that there was a strength greater than that of man, a power that holds the ocean in the hollow of His hand. "I fell on my knees," he said, "and as the raft swept round in the current, I asked God to aid me. I spoke as if from my very soul, and said, 'Oh, God! if there is a way out of this fearful place show it to me; take me to it.'" Here White's voice became husky, and his somewhat heavy features quivered as he continued—"I was still looking up with my hands clasped when I felt a different movement in the raft, and turning to look at the whirlpool, it was some distance behind, and I was floating down the smoothest current I had yet seen in the cañon."

This statement is the only information White volunteered; all the rest was obtained by close questioning. One of his friends who was present during the examination smiled when White repeated his prayer. He noticed it, and said with some feeling: "It is true, Bob, and I'm sure God took me out."

Below the mouth of the Colorado Chiquito the current was very slow, and White felt what he subsequently found to be the case—viz., that the rapids were past, though he was not equally fortunate in guessing his proximity to Calville. The course of the river below this he describes as exceedingly "crooked, with short, sharp turns," the view on every side being shut in by flat precipitous walls of "white sand-rock." These walls presented white perpendicular surfaces to the

high water-level, which had a distinct mark of about forty feet above the August stage. The highest part of the cañon, White thinks, is between the San Juan and the Colorado Chiquito, where the wall appeared to him more than one mile (5,280 feet) in perpendicular height, and at a few points even higher. Dr. Newberry states, from barometrical observations, that for a long distance the altitude is nearly 7,000 feet. But we must not begin to draw conclusions too soon, much of interest remains to be told of this unparalleled adventure.

The current bore White from the Colorado Chiquito slowly down the main river. His clothing was torn to shreds, and the few rags which clung to his frame were constantly saturated with water. Each noon the sun looked into the cañon only to pour his almost vertical rays on the famishing man, and to burn and blister those parts of his body that the scanty rags did not cover. One, two, three, four days dragged slowly past since he tasted food, and still the current bore him through the towering walls of the cañon. The hunger maddened him. He felt it burning into his vitals. His thoughts were of food! food! food! and his sleeping moments were filled with Tantalus-like dreams. Once he raised his arm to open some vein and draw nutriment from his own blood, but its shrivelled, blistered length frightened him. For hours as he floated down he would sit looking into the water, yet lacking courage to make the plunge that would rid him of all earthly pain. On the morning of the fifth day since he had tasted food, he saw a flat bank with some mezquit bushes upon it, and by using all his strength he succeeded in reaching it with his raft. He devoured the few green pods and the leaves of the bushes, but they only increased his desire for more. The journey was resumed, and he remembers that during the last two days of unbroken

cañon wall, the rocks became very black, with shining surfaces—probably where the igneous took the place of the cretaceous rocks.

Six days without food, save the few green leaves, and eleven days since starting, and still the uneven current bore on the raft with its wretched occupant. He saw occasional breaks in the wall, with here and there a bush. Too weak to move his raft, he floated past and felt no pain, for the overwrought nerves refused to convey sensation.

On the afternoon of this, the sixth day, he was roused by hearing the sound of human voices, and, raising himself on one arm, he looked towards the shore, and saw men beckoning to him. A momentary strength came to his arms, and, grasping the paddle, he urged the raft to the bank. On reaching it he found himself surrounded by a band of Yampais Indians, who for many years have lived on a low strip of alluvial land along the bottom of the cañon, the trail to which, from the upper world, is only known to themselves. One of the Indians made fast the raft, while another seized White roughly and dragged him up the bank. He could not remonstrate; his tongue refused to give a sound, so he pointed to his mouth and made signs for food. The fiend that pulled him up the bank, tore from his blistered shoulders the shreds that had once been a shirt, and was proceeding to take off the torn trousers, when, to the credit of the savage be it said, one of the Indians interfered, and pushed back his companions. He gave White some meat, and roasted mezquit beans to eat, which the famished man devoured, and after a little rest he made signs that he wanted to go to the nearest dwellings of the white men. The Indians told him he could reach them in "two suns" by his raft, so he stayed with them all night, and with a revolver that remained

fastened to the logs, he purchased some mezquit beans, and the half of a dog.

Early the next morning he tottered to the bank, and again pushed into the current. The first day out he gave way to the yearnings for food, and, despite his resolution to the contrary, he ate up his entire stock of provisions, which did not, by any means, satisfy his craving. Three long days of hope and dread passed slowly by, and still no signs of friends. Reason tottered, and White stretched himself on the raft; all his energies exhausted, life and death were to him alike indifferent.

Late in the evening of the third day after leaving the Indians, and fourteen days from the time of starting on this perilous voyage, White again heard voices, accompanied by the rapid dash of oars. He understood the words, but could make no reply. He felt a strong arm thrown around him, and he was lifted into a boat, to see manly bearded faces looking on him with pity. The great objective point, Calville, was reached at last; the battle for a life was won, but with the price of unparalleled suffering. The people of this Mormon settlement had warm, generous hearts, and, like good Samaritans, lavishly bestowed every care on the unfortunate man, so miraculously thrown into their midst from the bowels of the unknown cañon. His constitution, naturally strong, soon recovered its terrible shock, and he told his new-found friends his wonderful story, the first recital of which led them to doubt his sanity.

Charles McAllister, at present an assistant in the store of Mr. Todd at Fort Mojave, was one of the three men who went in the boat to White's assistance. He said that he never saw so wretched a looking man as White when he first met him; his feet, legs, and body were literally flayed, from ex-

exposure to drenching from water and the scorching rays of the sun. His reason was almost gone, his form stooped, and his eyes were so hollow and dreary, that he looked like an old and imbecile man. Mr. W. H. Hardy, of Hardyville, near Fort Mojave, brought White thither, that we might see and talk with him. Mr. Hardy corroborates the statements of McAllister, and from his knowledge of the country above Calville, says that it would be impossible for White to have come for any distance by the river, without travelling through the whole length of the Great Cañon of the Colorado.

Mr. Ballard, a mail contractor, in whose employment White is now earning money to take him home, says he believes him to be a sober, truthful man; but, apart from White's statement, Ballard is confident he must have traversed, and in the manner stated, that hitherto unexplored chasm which completes the missing link between the upper and lower course of the Great Colorado.

Dr. Parry, our geologist, thinks that the subjoined conclusions may be summed up as some of the new additions to our previous geographical knowledge of the hydrography of the Great Colorado of the West, derived from this remarkable voyage.

1. The actual location of the mouth of the San Juan forty miles below Green River junction, and its entrance by a cañon continuous with that of the Colorado, above and below the point of junction.

2. From the mouth of the San Juan to the Colorado Chiquito, three days' travel in the swiftest portion of the current allowing four miles per hour for fifteen hours or sixty miles per day, would give an estimated distance of 180 miles, including the most inaccessible portion of the cañon.

3. From the Colorado Chiquito to Calville occupied ten

days' travel. As this part of the route was more open, and probably comprised long stretches of comparatively. still water, it would not be safe to allow a distance of over thirty miles per day, or 300 miles for this interval. Thus the whole distance travelled would be 550 miles, or something over 500 miles from Green River junction to the head of steamboat navigation at Calville.

4. The absence of any distinct cataracts, or perpendicular falls, would seem to warrant the conclusion that in time of high water, by proper appliances, in the form of india-rubber boats and provisions secured in waterproof bags, with good resolute oarsmen, the same passage might be safely made, and the actual course of the river mapped out, and its peculiar geological features properly examined.

5. The construction of bridges by a single span would be rendered difficult of execution, on account of the usual flaring shape of the summits. Possibly, however, points might be found where the mesas approach sufficiently near each other for such a purpose.

6. The width of the river, at its narrowest point, was estimated at 100 feet, and the line of high-water mark at forty feet above the average stage in August.

7. The long-continued uniformity of the geological formation (termed "white sandstone," probably cretaceous) is remarkable; but under the term may have been comprised some of the later stratified formations. The contrast on reaching the dark igneous rocks was so marked that it could not fail to be noticed.

8. Any prospect for useful navigation up or down the cañon during the season of high water, or the transportation of lumber from the upper pine regions, could not be regarded

as feasible, considering the long distance and the inaccessible character of the river-banks.

9. No other satisfactory method of exploration, except along the course of the river, could be adopted to determine its actual course and peculiar natural features; and James White, as the pioneer of this enterprise, will probably long retain the honour of being the only man who has traversed, through its whole course, the Great Cañon of the Colorado, and lived to recount his observations on so perilous a trip.

CHAPTER XIV.

THE RETURN JOURNEY *viâ* SALT LAKE.

Leave San Francisco.—Ascending the Sierra Nevada on the Central Pacific Railroad.—Sledging across the Mountains.—Virginia City.—Our Fellow Passenger.—Staging across the Desert.—How we crossed an "Alkali-flat."—Austin.—The Mormons.—Polygamy.—Will they migrate or will they remain?—The Anti-polygamy Party.—Mr. Dilke on Mormonism.—The Electric Telegraph in the Desert.—Cross the Black Hills.—Cheyenne.—Drive to Denver.—Enormous herds of Antelope and Buffalo.—Fort Wallace again.

LATE on the afternoon of February 21st I started from San Francisco, and took the river boat for Sacramento, where next morning I was joined by Palmer and Colton. We left the State capital enveloped in steaming drizzle, and were glad to exchange the sultry oppression of the coast for the snow-flakes and bracing air of the Sierra Nevada. We were told by the "conductor" of our train, as we left the depôt of the Central Pacific of California, that the mountains commenced two miles east of Sacramento. It is necessary to be told this fact, for to all appearance the country is a dead level, and the only way of accounting for it is, that so the government has decided.

The line does however ascend, though gradually, for sixty miles, at which point we entered the snows at an elevation of 2,700 feet, and very soon the mountain scenery became Alpine in its character, and snow-clad giants appeared and disappeared amongst the clouds and drifting snow-flakes. The train twined in and out amongst the mountains like a serpent; sometimes clinging closely to the edge of a precipice

ose depth was lost in the mist below, sometimes crossing
p ravines on lofty tressel bridges, now dashing through a
nel, then entering a mile or two of snow-sheds, and at
es whirling round so sharp a curve that we felt as if
trifugal force would send us flying off the rails. Higher
the grades became steeper ; another engine was added as a
sher to the train, and our speed was much reduced. The
tas up and down the ravines between the mountains were
erb; the graceful Californian pines, with their dark
age, seemed to rest their heavy limbs upon the white
stening breasts of the hills, for so deep was the snow that
bare portions of the trunks were buried beneath it.

I was strongly reminded of one scene in Switzerland as we
pt up the mountains—the pass of the Col de Balme into
Valley de Chamounix.

At thirteen miles from the summit we reached the temporary
it of the railway, and exchanged the warmed cars for the
erland Mail Company's sledges. There were half-a-dozen
these waiting our arrival, each drawn by three pair of
stangs, in the sleekest possible condition. The sun was
ing, and a brilliant crimson tint was thrown for a few
ments over everything as we dashed off with a chorus of
oops from the drivers, and shot like lightning over the
d crisp snow.

Those who cross the mountains by stage in summer enjoy
te an exciting drive; those who pass over them by sledge
ing the winter revel in scenes of inexpressible grandeur.
From twenty to forty feet of snow lies below you, the summits
e to be crossed at an elevation exceeding 8,000 feet, the
l is cut for miles along precipices whose edges are but
uely visible to the stranger even by a bright moonlight,
the cold is intense, so much so that a dozen thicknesses

of shawl or blanket wrapt over your head fails to keep the piercing icy blast. For all this there is so much life excitement in the scene that even the drivers, who accustomed to it, wake up from their usual stolid moodin and playfully "wake up" their horses also. How we das on through the snow, up hill and down dale, all through night! About twelve o'clock we had a biting snow-sto which completely covered the track, and left us nothing steer by but the long row of poles which were stuck in snow to mark the road. Much of the country upon summit was level, or nearly so, and there the snow deepest. The lofty telegraph poles only just raised the w above the surface, and many of the younger firs showed more than their tops above the crust.

The track upon which we drove, or rather galloped, only wide enough for one vehicle, and now and then through the night one or other of the sledges would run the beaten way and upset in the deep snow, dragging the hor after it, and burying them up to their necks. Then we would have to tumble out, and help to lift the sledge on to the track again. We all got upset in turn, and some of our parties twice; and occasionally we met trucks on runners, returning for fresh loads of railway iron, or sledges coming from the opposite direction. There was no room to pass on the track so that one or other had to run into the snow, and submit in cold blood to being upset.

Thus the night went by. We changed horses every sixteen miles, and arrived by morning at the head of Donner Lake, at the eastern slope of the sierra, where the snow had already thawed so much that we were obliged to leave our comfortable sledges and proceed by mud-wagon to Virginia City, about eight hours farther on.

A mud-wagon is shaped like a coach, but it is hung lower, more heavily built, and has its sides made of canvas instead wood and glass.

Most of the passengers who occupied the six sledges were oked for Virginia City; where, next morning, we learned at only two were going to join us across the Great Basin. e were discussing after breakfast the merits of the different ver mines, and trying to decide upon which to visit on the nous Comstock lode, when a very tall and bulky man, his ir cropped as close as that of a convict, with a round, jovial, ardless face, and enveloped in a huge overcoat made of the ickest of Californian blankets, offered his services in the st friendly way, and took us to the Savage Mine, where we atched the rapid extraction of the grey and white quartz, any pieces of which were glistening with silver.

The Comstock lode and the silver mines which ramify rough it have been too often described to require any mment here. Our bulky friend, the jovial proprietor of the ccidental Hotel of San Francisco, may not be as well known the East as he is throughout the Far West; and since he ecame from this time the most prominent feature of the omeward journey, I must describe our start from Virginia ity, and introduce him in doing so.

When Palmer, Colton, myself, and another passenger, had eated ourselves and packed away our wraps and blankets, to se whenever any great increase of elevation should make it ery cold, the agent called out for Mr. Leland, and as Mr. eland did not respond to the summons, he had forcibly to e conducted from the bar-room by his friends (to whom he ad been saying good-bye in the usual manner nearly all the morning), and pushed with difficulty, blanket, coat, and all, hrough the door of the mud-wagon; then came half-a-dozen

blankets to match the coat, and sealskin boots reaching to hips; then a large bag, labelled "muck-a-muck," which soon informed us was food for the journey, should we n anything between times; then came a gallon keg of whisk then a second ditto, then a third, a fourth, and, lastly demijohn of the same. Bang went the door! "All aboa Whoop!" shouted the driver, as he cracked the whip o the leaders; and thus, amidst a chorus of cheers from new acquaintances, and a long string of messages to To Dick, and Harry from the stentorian voice of Leland, as bid them good-bye, we bumped and rattled through Virgi City. The whiskey was all finished before we reached S Lake; and, although it was at times a nuisance, and notwi standing the fact that the owner of it drank with every along the road, whether they wished or not, it was, neve theless, a source of great amusement, and probably help the horses, *through the driver*, out of many a "tight" place.

Travelling day and night by stage across 700 miles desert is wearisome at all times, but it is especially tryin when the frost first breaks up, and the soft, friable soil converted into mud which is slightly frozen over at nigh and lets the wheels sink through it to the axletrees. Th happened to be our case. Had we been one week earlier, w could have gone upon a smooth road from Virginia Cit to Salt Lake in four days. As it was, our average rate progression was reduced to two miles and a quarter per hour. All the "alkali flats" were flooded and covered with ice, too thin to bear, but quite thick enough to damage the legs o the horses; the ruts were terrible, and both through the day and night we were jolted, first on one side, then on the other, and thrown violently forward into the arms of our *vis-à-vis*. Every now and then the driver would call out, "Left!" or

Right!" which meant that those inside were to bear all their weight on the side named, to prevent the wagon from being upset on the other. Twenty times at least we stuck in the mud, and had to spend hours in digging out the wheels; and there was not a single night in which we had not to turn out and walk over some especially bad place.

On one of these occasions, the driver pulled up at the edge of a large sheet of water, covered with about an inch of ice. It was bitterly cold, and there was no moon; the ground was so boggy that it was very doubtful whether we could possibly reach the opposite shore, two miles distant, and yet we could not stop where we were. This time we were drawn by four powerful horses; and it was at last decided that Colton, the other passenger, the driver, and myself, should first ride the horses across, and then that they should return for the others. How we got through it I can hardly say; the water reached above the horses' girths; every instant they would lose their footing in a cart-rut or a boggy spot; at some places the ice would almost bear, and then it would suddenly break and let us through. We reached the other side, however, soaked to the skin, and fast stiffening, as our clothes froze around us. Back went the horses; but when the driver contemplated the probable fate of seventeen stone, enveloped in a Californian blanket coat, attempting to cross an alkali flat, his heart failed him, and he determined to put the horses to again. In the course of a couple of hours, the horses succeeded in getting the wagon across, and we all went on again. A little farther we met another stage, which, from the steady appearance of the lights, as seen from a distance, was evidently at a standstill. This mud-wagon was buried up to the body in mud; it carried no passengers, but was heavily laden with bars of silver, which lay at the bottom of the wagon. The

driver, being alone, could do nothing; so we set to work, too out the silver, dug out the wheels, and fastened our ow horses in front of the others. Having set this "outfit moving again we started afresh, with very considerable doub however as to how it would get through the alkali flat.

Time, of course, could not be kept, and we took our meal at any hour during the day or night; at last we became s demoralised that no distinction could possibly be discovered between breakfast, dinner, or tea; so that all went indefinitely under the name of supper. We usually supped once every eight hours, and did not therefore suffer from want of food.

About half-way across the desert, four days from Virginia City, we reached Austin, at which thriving mining town we rested for a night, and enjoyed the luxuries of a dinner, a bed, and a breakfast. Nothing is more surprising than the good fare which can be had at most of the mining towns in California and Nevada. Our dinner at the French restaurant was fine; we had fresh oysters from San Francisco, large salmon-trout from the Humboldt River, and a variety of dishes beautifully cooked and served. We drank Perrier Jouet of the best quality, and claret which was not to be despised. Of course, the luxuries were expensive, but they were supplied on all sides to the groups of miners and others who were dining with us.

Two days' and nights' more travel brought us to the Mormon city, where we remained some time to recruit our strength and see the place.

"Have you been to Salt Lake?" and "What do you think of the Mormons?" were the two questions I had most frequently to answer on my return home.

Although the Mormons have been too much written on as well as "too much married," yet I do not altogether agree with

much that has been said of them lately, and shall not there-
re remain altogether silent on this subject.

The English view of the Mormon question is very different
om the American one; and as Utah is an American
erritory, not an English county, we should certainly con-
ider the question from an American stand-point. In the
irst place, I deny the common assertion that Salt Lake City,
etting aside polygamy, is a moral place and that the Mormons

A Mormon Family.

are a moral people. Is it likely, in a community where
men have almost unlimited license, that the women will
practise strict fidelity to their *masters* (husbands)? Poly-
gamy and strict morality have never up to the present time
existed in company, and my impressions of Salt Lake City
ed me to conclude that the Mormons are no exception to this
rule. Why should the Mormon elders mysteriously hint at

death as the punishment inflicted by them for female infidelity? Surely because they feel how impossible it is to maintain such fidelity in a community like theirs.

Every spot upon American soil, not occupied by the Mormons, is open to the world for trade or settlement; but a Gentile settler in Utah finds himself beset on all sides by so many petty annoyances, that he invariably decamps. Letters advising him to join the community are followed by others of a threatening character; and if these fail to *convert him*, more active means are taken to prove how useless, and even unsafe it is for him to resist the pressure of Mormon tyranny. Only conceive how offensive this is to the feelings of Americans!

The degradation of women, however, is the deepest grievance of all. There, in the midst of a country where woman appears to stand higher than anywhere else—where she is, on the whole, better educated—where her influence is greater, and where more homage is paid to her—a community rises up which is trying to lower her position to that of a servant in her own household. It may be very utilitarian, but it is extremely revolting to a people so sensitive on this subject as the Americans. It is rare to hear a Mormon husband talk of his wives, he always calls them *his women*, and this little fact speaks volumes. Usually, if you dine at an elder's table, his guests will be men, and his wives will wait upon the party.

It is customary to envelop Mormonism in a highly-coloured cloud of religious fervour; we are told how devotedly they trust to the guidance of God; how strict they are in their religious observances; how they bring religion into their daily life, and walk as saints upon earth. In reality, however, there is, amongst the Mormons, an entire

absence of religious devotion. To an ordinary individual, they appear to worship no deity but the works of their own hand—not wood and stone exactly, but coin and fruit-trees, factories and theatres. Their text is the old one—that Providence will help those who help themselves; and their whole religious teaching, if such it may be called, is pure utilitarianism. They may convert the poor people of Wales and Norway by concealing the truth; but it is very doubtful whether they ever make one true male disciple in America—that is, one who joins them from religious conviction, and that alone.

The day after leaving Salt Lake City we picked up a very curious little fellow on the road. He was a hump-backed German Jew, and expressed strongly in his features that quick and combative form of mental development traditional to dwarfs. I was much amused at one remark he made, and it very well expresses the general opinion amongst frontier men. We were all standing over a blazing log-fire at a ranche in the Bitter Creek country, and I was listening to a tall Western man as he laid down the law on the Mormon question, when one of the party remarked in the forcible language of the country, that he could not conceive how any man could have the bare-faced impudence to set himself up as a Christ amongst the people, as Brigham Young has done. At this, the little hump-back squeaked out from one corner, "He ish right! he ish right! How much monish do you shppose he hash made?"

In truth, the Mormons are becoming very wealthy; and, indeed, they are not the only section of the "faithful" who have profited by their position on the great highway of travel across a continent. Besides, their colonization system is perfect, their government is very effective, and the taxation-

screw is not applied until the settler is firmly rooted; then, however it is sharply turned, and the man finds, when it is too late, that he has to pay very dearly for the start given him in life by his Mormon brethren.

It is interesting, although not perhaps very profitable, to speculate on the future of these people.

Will they migrate, or will they remain? Will they modify their views and actions, or will they hold out against Americanization? The last year or two has shown, I think, what course events are likely to take. The Mormons know perfectly well that they will remain unmolested and in full possession of all the lands they have taken without acknowment from the United States' Government, if they only give up polygamy. They may profess to believe what they like, and govern themselves as they please; but if they persist in degrading women as they at present do, some method will be devised to break up the "institution." Under the influence of this argument, the Joe Smith anti-polygamy party are making rapid strides, especially among the outlying settlements scattered over Utah and southern Nevada; and even the most orthodox of the saints are beginning to discover that polygamy is not an essential doctrine. Even the great Brigham has, I am informed, lately stated openly that he has received no direct revelation on this important subject; and that therefore, at present, although he is in favour of it personally, he cannot speak with authority either for or against the practice. This is fortunate, and leaves a very safe loophole for escape in time of need. The institution is very unpopular amongst the majority of the women, especially the younger ones. I used to discuss the subject a good deal with a young Mormon wife of great intelligence, and although she professed to approve of it to me, I found out

that she had insisted upon her husband's relinquishing the idea of taking a second wife into her own household.

The rank and file of the faithful are also becoming a good deal enlightened as regards the payment of tithes. They do not give so freely as formerly; and the loud complaints made by the bishops and elders on this head only prove how widespread is the feeling that they are being heavily taxed to no other purpose than that of maintaining a system of tyranny dignified by the name of "church government." "If," say those who are averse to polygamy, "we only do what is natural to our race, and refrain from marrying more than one wife, there will be no need then for maintaining a strong military organization, since the incentive to molestation will have been removed." This argument is one of the chief causes which makes the Joe Smith schism of such importance, and it may eventually break down the whole system. I certainly expect in time that the American forms of thought, which are so deeply rooted in the hearts of the masses, will prove to be too strong for Mormonism as it now exists, and that instead of any violent measures being necessary to remove the obnoxious sect to some more distant wilderness, its tenets will become modified into some system which can be tolerated while it lasts; for eventually it will die away, as thousands of other similar abnormalities have done since Christianity has been established.

Mr. Dilke, in writing on this subject, says: "Mormonism comes under my observation as the religious and social system of the most successful of all pioneers of English civilization. From this point of view it would be an immediate advantage to the world that they should be driven out once more into the wilderness, again to found an England in Mexico, in Polynesia, or on Red River." I cannot agree with him;

first, because I consider that even Mormon polygamy has t elements of social corruption and decay inherent; second because if rapid emigration and colonisation be the gr desideratum, we can obtain these ends far better by otl means than that of Mormonism—an institution which himself admits must give way again and again to t advancing tide of Christian Saxondom; and thirdly, becaus have yet to learn what kind of colony that will become whi was founded originally upon Mormon principles.

In crossing the western desert on the Salt Lake route you are never removed more than thirty miles from telegraphi communication with the civilized world. The system adopte on this line, as well as throughout the United States generally, is a most admirable one. Every message is ticked out simultaneously in every office all along the line; it is reproduced perhaps a hundred times at the same moment, and usually the office clerk takes no notice of it unless it is intended for his own station; then he listens to the ticking of the instrument, and writes off the message from the sound. All along the route there is a station every fifty miles, and as the impeachment trial of President Johnson was just commencing while we were on the road, our first inquiry on reaching one of these stations was whether there had been any fresh news from Washington. Sometimes the clerk would say that some messages had passed through for San Francisco, but he had not been attending to them. Sometimes he had the very latest news to give us of events which had only just transpired, the first of these being the impeachment itself; and not unfrequently a long abstract of speeches delivered in the Senate on the same day were traversing the wires whilst we were waiting at the station, and the clerk was able, without the least trouble, to give them to us word for word as

they were ticked out in passing. Many scraps of European news reached us in this way, and made it hard to believe that we were 6,000 miles nearer sunset than those who spoke to us through the wires. Brigham Young has private telegraph wires laid down all over Utah and the Great Basin, uniting his isolated communities with the central seat of government. These all enter his house near the Tabernacle.

We accomplished the 1,350 miles from San Francisco to the foot of the Black Hills by means of four kinds of conveyance; 124 miles were travelled by steamboat, 92 by rail, about 250 by sledges, and the rest in mud-wagons. The 250 miles of sledging were divided into five intervals of from 30 to 100 miles each, in which we crossed the highest mountain summits on the route; these were the Sierra Nevada, the Wahsatch Mountains, Reed's and Bitter Creek summits, Bridger's Pass, and the Black Hills. Such changes broke the journey, and rendered it much less fatiguing than it otherwise would have been. On reaching the station at the foot of the Black Hills, where the stages branch off to Denver and the south, we found that a heavy fall of snow had stopped the traffic by train along the Platte route; but as the storm had not extended as far west as the Rocky Mountains, travel was still open to Denver, and thence by the Smoky Hill Fork, our old route, to St. Louis. We woke up Leland, who was asleep in the boot—his favourite resting-place, but how he squeezed into it has ever remained a mystery—and held a consultation as to whether we should go on to Cheyenne or take the coach for Denver. The deliberations ended in a general break-up of our little party of four. Colton started off to see how the tunnel was progressing in Evan's Pass, Leland went on in the stage to Cheyenne, where he expected to meet many friends, and to get some refreshment before continuing his journey,

and Palmer and I took the world easy. We got a shake-dow on the floor of the ranche or stage-station, and had a go night's rest preparatory to starting for Denver by the mi day stage on the morrow.

The Denver stage started for Cheyenne at seven o'clock, that it reached our ranche about mid-day. As it came in sight we quickly spied a well-known bulky figure, enveloped in an equally well-known blanket coat, seated next the driver. His cap was on the wrong way; and when all the passengers had rushed from the stage to make the most of the twenty minutes allowed for refreshment, he alone remained master of his commanding position. "Well, Leland," we asked, "what do you think of Cheyenne?" "Pretty good sort of town for its size, Gen'l, but it is the most warlike place I was ever in. Whiskey! It's not whiskey at all, nor blue lightning either, its nitro-glycerine, you bet!" "But won't you get down, old fellow?" we suggested. "No, thankee," was the submissive reply, "I think I'll take a sleep in the boot."

The drive from the foot of the Black Hills to Denver was a glorious one, and occupied about nine hours. The same man drove us the whole way; his cattle were of the best, for traffic had been very light of late; and as the thaw had not reached this part of the route, the road was in splendid condition. During the whole distance of eighty miles we averaged nine miles an hour, including stoppages. The Rocky Mountains lay in full view of us all the way, gradually increasing in grandeur as we neared Denver; the moon was very brilliant, and the view over the plains to the eastward presented an endless expanse of undulating whiteness, upon which the moonlight played like phosphorescence on the sea. The complete solitude, the vastness of the expanse on all sides, the clatter of the four-in-hand as they dashed

along at a gallop, the keen sharp air, and the refreshing influence of a long night's rest made this drive inexpressibly delightful.

Three days passed quickly away at Denver, after which we again took to the stage, and continued our route southward to the end of the Kansas Pacific Railway, whose terminal depôt was at that time called Coyote. It was situated 295 miles from Denver, and ninety-two miles east of Fort Wallace, the old starting-point of our survey.

Between Denver and the fort we had no fear of Indians, nor need of escort, for the snow was yet on the ground, and the time for hostilities had not commenced. Big game, however, was most abundant here. One herd of antelope was so large that, although they commenced to bound like lightning across the road in single file as soon as they caught sight of us, the tail of the herd nearly came in contact with our leaders. Like many other wild animals which congregate in herds and follow a chief, all considered themselves bound to keep exactly in the same track. As for the buffalo, they were in prodigious numbers. I had heard of wagon-trains being stopped for a whole day to allow them to go by, of thousands taking fright and rushing helter-skelter over everything, and of places where it was absolutely necessary to provide against a stampede; but such a sight I never expected to see, and should never have witnessed had I returned, as I had expected, by the Platte.

On one occasion, about 150 miles from Denver, to the left of the road, as far as the eye could reach, that is for very many miles, the plain was completely covered with them. There were thousands, millions if you like, for such numbers were beyond calculation, and perhaps the best idea I can give of such a sight is to refer to the accompanying sketch,

which gives a fair idea of one of these countless herds of American bison.

Early in the morning of the 10th of March, 1868, we came for a second time in sight of Fort Wallace. I was sitting next the driver, and the sight of the red buildings and Sibley tents reminded me painfully of the scenes which had been enacted there during my last visit. I pointed out to the driver the ground upon which the Indians had fought our men, and I told him that there we had lost nine men killed and four wounded in one engagement. He turned slightly round, and gave me a curious look of suspicion as he said, "Now there I guess you lie, for I happened to be in every brush we had with the Indians along this here road last summer, and although we lost ones, and twos, and threes, some fours, and a five, we never lost nine at one time, I'll swar." He thought I had referred to a stage-coach skirmish.

But two of the old officers remained at the fort, the others had gone elsewhere, and one poor fellow had been killed by the red-skins. We stopped for an hour, and had a talk over the incidents of the summer. There were three companies now established here. All the houses which were being built when I knew the post were finished, and a fine hospital had been added, composed entirely of the building stone found in the vicinity. Next morning we reached the rail, and thus returned to St. Louis.

PART IV.

THE PACIFIC RAILROADS.

THE PACIFIC RAILROADS.

CHAPTER I.

HISTORY OF THE PROJECT.

If we were to start from the very commencement of the Pacific Railroad project and trace its gradual development, we should glance in succession over all the great events which have crowded so thickly upon each other during the last twenty years of North American history. All influenced it one way or another, some retarding and others hastening it towards maturity. At the close of the Mexican war in 1848 the people of the United States found themselves possessed of the whole country lying between the Mississippi and the Pacific Ocean. California, New Mexico (now New Mexico and Arizona), and Texas were then united under the one flag; and not long after this event the Pacific Railroad question became a pet subject for speculation amongst the most advanced promoters of railway enterprises.

The first printed notice of such a scheme, however, dates much further back, for in the *New York Courier* of 1837, an article was written by a Dr. Hartley Carver, advocating a Pacific railway. As is usual in such a case, the doctor had his reward; by some he was considered a wild enthusiast, by others a madman.

One year only after the conclusion of the Mexican war

came the cry of gold, which sent thousands of miners fr every quarter of the globe, by every route, to California a the Pacific coast. Whilst the greater number went by around the Cape and across Panama, thousands boldly set from the Eastern States by land into the unknown regions the Far West, and crossed the continent by different rou on different parallels of latitude.

Under the stimulus of this fresh necessity for a trans- continental highway, the Pacific Railroad enterprise could no longer be kept out of Congress; and early in the decade of 1850 it received the cordial support of both branches of the legislature. By an Act passed March 31st, 1853, the War Department was entrusted with the task of making such explorations and surveys as it might deem advisable in order to ascertain the most practicable and economical route for a railroad from the Mississippi River to the Pacific Ocean, and the necessary appropriations were duly granted. The Secretary of War at that time was none other than Mr. Jefferson Davis, and the result of the explorations made under his direction between 1854 and 1857 are comprised in the thirteen bulky volumes of Pacific Railroad Reports, which are as well known to botanists, naturalists, and geologists as to geographers and engineers.

Two-thirds of the territory of the United States lies to the west of the Mississippi, and crouched along the centre of this vast tract, barring off as was supposed the westward wave of population, stretch the Rocky Mountains—that great Grisly Bear, over whose body it was thought impossible to step; but these Pacific surveys threw great light upon the anatomy of the Grisly Bear. They proved that his back was very broad, that the slope up his sides was very gradual, that his spine did not extrude unpleasantly in the centre, but

ay, on the contrary, rather sunk between the two rows of muscles or mountains on either side. They found depressions along the spine—such as the North, Middle, South, and St. Louis parks—shut in on each side by the rows of muscles which made the animal so formidable. They showed, moreover, that, although he had a hump on his back (the centre of Colorado), from which his muscular frame sloped down on all sides, yet that this was flat also, and could be surmounted, if necessary, even by a railroad; that his body ended about the 35th parallel, only leaving an insignificant tail in the way south of that line; and also that his broad shoulders (the Laramie plains), although exceeding 7,000 feet in height, were so smooth and rounded off that they almost invited the pathfinder to choose this place for crossing in preference to any other.

The chief routes examined and reported upon were the following:—

1st. Between the 46th and 48th parallels, to unite Lake Superior and the head of navigation on the Mississippi with Puget Sound and the Columbia River. This has developed into the North Pacific Railroad route.

2nd. Between the 41st and 42nd parallels, to unite the Missouri River at Council Bluffs (Omaha) with the harbour of San Francisco. This has developed into the Union Pacific Railroad.

3rd. Between the 38th and 39th parallels, from Westport (Kansas City), at the great bend of the Missouri, due west across the continent. This was an attempt to run an "air-line" straight over the hump on the bear's back through the centre of Colorado, and thence in a direct line to San Francisco. The muscles on the eastern side were found to present no insurmountable obstacles, and one of the depressions (the

St. Louis Park) along the spine was easily crossed; but the muscles on the other side, and the furrows or gorges between the ribs made this route quite impracticable.

4th. Near the 35th parallel from Fort Smith, on the Arkansas River, to the harbour of San Pedro (Los Angeles) on the Pacific coast. This route, with the important modification of changing the starting-point to Kansas City on the Missouri, and the Pacific terminus to San Francisco, is the one proposed by the Kansas Pacific, which stands in the same relation to St. Louis that the Omaha line does to Chicago.

5th. Near the 32nd parallel, uniting Preston on the Red River in Eastern Texas with the Pacific at San Diego, San Pedro, or San Francisco.

When all these surveys had been completed, and Mr. Davis had carefully weighed and examined the results, this last route was the one to which he gave the preference, strongly urging its adoption by Congress. It was said with perfect truth, that if the Atlantic and Pacific Oceans were to rise to the height of 4,000 feet they would meet about the 32nd parallel of latitude over the vast plateau south of the Rocky Mountains—the Madre Plateau; while the greater part of the continent to the northward, as well as the lofty plateaux of Mexico to the south, would form two huge islands, separated by this strait. Although the surveys across other sections of the continent had almost swept away the conventional idea of the Alpine grandeur of the Rocky Mountains, yet they were too rapidly conducted, and the task was too great to remove minor obstacles, which swelled the estimates of the cost of a trans-continental railway to sums which made such an undertaking appear all but hopeless. The level route by the 32nd parallel shone out in striking economic contrast to all the rest, and the result was that

10,000,000 dollars were immediately given to Mexico in payment for shifting her boundary line a little farther south to make way for the railway.

Between 1853 and 1860 the political horizon was gradually assuming a lowering aspect. The storm was gathering which ultimately revolutionised the Pacific Railway question, as it did almost every other great question throughout the States. Whilst Southern influence appeared to be, as usual, carrying everything before it at Washington, and the truce brought about by the Missouri compromise was being respected in the East, the vital questions of slavery, State rights, and the rest, were being solved in the Far West throughout "bleeding" Kansas, Arkansas, Missouri, and the surrounding territories, with a freedom and rough rapidity natural to the condition of the inhabitants. The climate influences were adverse to slavery and weighed heavily on the side of those emigrants who poured in from the Free States with an ever-increasing majority, bringing with them political emotions verging on fanaticism, and a fixed determination to uphold the laws of equal justice to all men at any sacrifice. The pro-slavery platform was defeated in the West, war followed as a direct consequence, and the almost matured project of constructing a Southern Pacific Railroad by the 32nd parallel fell through as a matter of course.

The Pacific Railway question soon took another form. Statesmen whisperingly asked each other, What if the Pacific States were to waver in their loyalty to the Union? Their isolated position was for the first time keenly felt, and thus the necessity of binding California closely to the North by iron ways laid across the continent, became the highest card held by those who made it their business to agitate for a Pacific Railroad. Again the question came prominently before Con-

gress; but, before watching the result of this political cont at Washington in 1862, we must glance for a moment at hands of the players.

California held some great cards. The production of g had been enormous; agriculture had developed into interest rivalling that of mining; cereals were raised quantities far exceeding the local demand; southern Ca fornia had added grape culture to stock raising, and was striving to export wine as well as hides and tallow; trade had sprung up with Oregon, the Sandwich Islands, and, most important of all, with China; quicksilver was almost flowing from the mines of Almaden, and the strong desire felt by the Californians for a Pacific Railroad was brought to a climax by the discovery that a practicable route across the snow-clad sierra did exist through Donner Pass, midway between San Francisco and Virginia City. Some of the richest merchants pledged their entire fortunes to the scheme; the State Legislature liberally gave its sanction and aid; and it only remained for Congress to grant a fitting subsidy. Nevada had one high trump card to play in support of California. The Comstock lode had been discovered, and the wealth of silver which poured from it had already raised that Territory into the council of the States.

Chicago and the north-west backed by New York, and St. Louis and the middle States supported by Philadelphia, carried with them to Congress most powerful but antagonistic influences. The railways of the eastern States and their prolongations westward may be said to form two separate railway systems, the one having Chicago in the north-west as its western terminus, the other St. Louis, the most central point in the Mississippi valley. The capitalists of both these cities, fully alive to the importance of directing the Pacific

'ade through their own commercial centres, came forward ager for the contest which would bring so much triumph nd profit to the winning side. The men of Chicago urged hat they had already projected three lines across the State of owa to meet at Council Bluffs (Omaha), where they were ridging the muddy Missouri; that from this point to the Rocky Mountains, Nature herself had graded a line for them up to the very summit of the continental watershed, that here only a few hills had to be crossed, that another 500 miles would take them to the great Mormon settlement at Salt Lake, and that their Californian friends assured them that the Sierra Nevada might be crossed at the back of Virginia City, and San Francisco reached, without any insurmountable difficulty.

St. Louis, on the other hand, pleaded that she had passed from words to deeds; that lines westward had not only been projected but built; that the Missouri Pacific Railroad, commenced in 1857 with aid from the State, already ran straight as an arrow westward across Missouri to Kansas City; and that, lastly, as Kansas (not Nebraska) was the "mediterranean" State, and St. Louis more central than Chicago, Kansas City and not Council Bluffs, should be the starting-point of the grand route westward. Money was spent like water in the contest. I remember seeing it stated in an American journal that one company alone "employed the element of influence" to the extent of three millions of dollars. The civil war was hotly raging on all sides, and the whole nation was in a ferment. Five hundred thousand pounds sterling were leaving the treasury daily to meet the current expenses of the Northern armies; even Washington was threatened, but for all that the Pacific Railroad Bill was carried triumphantly. Grants of land

and a large subsidy, increasing in amount as the l[illegible] advanced westward, were granted, but no definite c[illegible]clusion was arrived at as to the eastern starting-point [illegible] of the route. The great precedent, however, was established— that Government aid, to the extent of about half the t[illegible]otal amount necessary, would be provided out of the natio[illegible]nal treasury to assist a Pacific Railroad enterprise. Bills succeeded each other in rapid succession, and party contests raged hotly at every session; until, finally, the following programme was definitely adopted, and the undertaking was actually commenced.

The main line was to extend from Omaha on the Missouri River to Sacramento, in California, 1,721 miles. St. Louis was to be provided for by a subsidised branch line to connect with the main line on or about the 100th meridian of longitude east of the Rocky Mountains. Three companies were to prosecute these works, and to stand on an equal footing as regards land grants, loans, mortgages, &c.

First: the Union Pacific Railway Company, constructing the line westward from Omaha.

Second: the Central Pacific Railway of California, proceeding eastward from Sacramento. These companies were to make their roads as quickly as possible from either end, and to meet at an intermediate point not fixed. Thus it was to the advantage of each to lay as much track as possible; for the amount of Government subsidy, as well as the share of managemental influence, depended upon the proportion of line laid.

Third: the Union Pacific Railway Company (Eastern Division) obtained the Government subsidy for a distance of 400 miles west of Kansas City. Thus it is evident that Chicago had gained the day. If the civil war had not intervened I

ink it more than probable that although 1869 might not ve seen the locomotive plying between New York and the acific, we should never have had an iron road laid across e Black Hills. Chicago would have built the branch line, nd the main trunk would have been laid farther south, below he barrier of winter snows; it would have passed round the Rocky Mountains, not over them; across productive valleys, instead of through worthless deserts; and along the rich central trough of California, instead of climbing an alpine pass more than 7,000 feet above the Pacific.

The chief clauses of the Government grant are these:—

Congress confers upon the three companies mentioned the right of way through all its territories, an absolute grant of 12,800 acres per mile of the public lands through which the roads run; *i.e.*, alternate sections of one by twenty miles on each side of the line; the right to use the coal, iron, timber, &c., thereon; and authorises a special issue of United States' Bonds, bearing 6 per cent. interest, proportionate in amount to the length and difficulty of the lines, to be delivered to the companies as the works progress; and, as short sections of the road (usually twenty-mile sections) are passed by the Government inspectors as being satisfactorily completed.

The distance from Omaha to Sacramento is 1,721 miles; and the grants of bonds are as follows:—

Between the Missouri and the eastern base of the Rocky Mountains (525 miles), 16,000 dollars per mile; Rocky Mountain section (150 miles), 48,000 dollars per mile; Salt Lake section (900 miles), 32,000 dollars per mile; Sierra Nevada section (150 miles), 48,000 dollars per mile. Total issue in bonds, about 50,000,000 dollars. The Kansas branch received a subsidy of 16,000 dollars per mile for 381 miles; and other short branches were similarly subsidised.

The time of maturity for these bonds is placed at thirty years after date of issue. They are made subordinate—standing in the position of a second mortgage—to the bonds issued by the companies, under the following important restrictions, viz.: That the railroads and telegraph lines be kept in proper repair; that the companies shall always give Government dispatches, munitions of war, &c., the preference when required, and shall not charge higher rates for their transmission than are paid by private parties for like services; that all compensation for services rendered to the Government shall be applied to the *payment of said bonds and interest* until the whole amount is fully paid; and that at least 5 per cent. additional of the net earnings of the railroads shall also be annually applied to the liquidation of the Government bonds as soon as the roads are completed. The Californian Company, on consideration of the natural obstacles to be surmounted, were allowed to retain during construction one-half of the compensation for services rendered to the Government.

Mortgages, equal in amount to the subsidies, were authorised to be issued from time to time as first mortgage bonds, bearing the same date, time of maturity, and rate of interest as those loaned by the Government. A small amount of capital stock was subscribed in each case. Thus the two railway companies which have just completed the Salt Lake line state their construction resources as follows:—

UNION PACIFIC RAILROAD.

CONSTRUCTION AND EQUIPMENT RESOURCES FOR 1,100 MILES OF RAILROAD.

	Dollars.
United States' Bonds	29,328,000
First Mortgage Bonds	29,328,000
Capital	13,243,000
Total	71,899,000

I have purposely omitted the land grant of 14,080,000 acres, as it is not immediately available for income.

CENTRAL PACIFIC OF CALIFORNIA.

CONSTRUCTION AND EQUIPMENT RESOURCES FOR 726 MILES.

	Dollars.
Donations (without lien)	11,225,000
Capital stock	8,000,000
Net earnings to 1867	1,520,235
Bonds (State guarantee)	3,000,000
First Mortgage Bonds	25,517,000
United States' Bonds	25,517,000
Total	74,779,235

Fourteen million dollars of this sum represent the liberality of the State of California and its wealthy citizens, and form an additional source of revenue for which the eastern company has no equivalent.

These sums are far more than sufficient to carry out the work according to the American system; but neither company will either require or call up all this capital, for both lay claim to building a greater mileage of road than the total length requires. They met on the 11th of May about the meridian of Salt Lake; thus giving 726 miles to the western company, and 995 to the eastern.

CHAPTER II.

THE OMAHA LINE (UNION PACIFIC AND CENTRAL PACIFIC OF CALIFORNIA).

THE Union Pacific Railroad runs through the Platte valley from Omaha to Julesburg (377 miles), and that of Lodge Pole Creek (a tributary) to the foot of the Black Hills, about 160 miles farther. Of these 537 miles, only the first 150 pass through land susceptible of cultivation. But one-fifth of Nebraska can be cultivated without irrigation, and the remainder cannot be irrigated because the scanty streams which traverse it are useless for that purpose. Beyond the limits between long. 98° and 99°, where the rain-fall is insufficient to raise crops, good grazing lands extend for about 100 miles, when we gradually enter a region so parched and barren that it can scarcely support a meagre covering of stunted grass. Three hundred miles of this arid region have to be crossed before the traveller, having imperceptibly ascended the slope of the continent to an elevation of 6,500 feet to the foot of the Black Hills, finds the pasturage improve, from its close proximity to the mountains. But as the Black Hills are low, they do not cause sufficient rain-fall to enable the farmer to settle on their eastern slopes. For 500 miles scarcely a tree is to be seen. The River Platte presents to the eye, at most seasons of the year, a vast expanse of sandy bed, often one mile wide, with a few trickling streams meandering like silver threads around innumerable sand-banks and islands, some few of which are covered with cotton-wood trees. These

beautiful clumps of foliage are soon left behind, and nothing remains to break the monotony of the undulating plains but the bluffs or cliffs which mark the edge between the sunken valley and the parched plateau beyond.

In the Black Hills some fine views of timbered country are obtained, and the dividing ridge is crossed with ease at an elevation of 8,262 feet, no grade being higher than ninety feet, and this only for a short distance. The Laramie plains are then crossed. They form, for the most part, a level upland plateau, exceeding an elevation of 7,000 feet. They are covered with good pasturage, particularly along the courses of the streams. During the short summer which exists here the ranche-men have found it possible to raise some garden vegetables; but even oats, although they come up well and form capital fodder, will not ripen. These plains are bounded on the west by a broad undulation, or range, forming the continental water-parting. No engineering difficulties occur here, and the Pacific slope is reached without a tunnel or any grades steeper than 75 feet per mile, which it is necessary to resort to for a short distance. One hundred and forty miles separate the Black Hills from this summit.

North of the Laramie plains lies the Sweet-water mining district, which is now attracting thousands of gold-diggers. South of it lie the gold-fields of Colorado, many of which are supplied at the present time with nearly all the necessaries of life from Cheyenne,—the Denver of these northern mining districts.

The sterility of these regions is not an unmitigated evil to the railroad which crosses them; for the miners, whose wants are very great, require all the necessaries and many of the luxuries of life to be carried to them by rail. A non-producing population—say of 1,000 miners—as well on account

of their migratory habits as their many requirements, is a larger source of revenue to a railroad than six times the population dependent upon agriculture, even if we disregard altogether the transportation of ores, an item often of the greatest importance.

After crossing the continental water-parting through a pass at Benton (near Bridger's Pass)—elevation, 7,534 feet—the railroad leaves the Rocky Mountains and traverses the Bitter-Creek country; crosses Green River, the main tributary of the Rio Colorado of the West; and reaches the foot of the Wahsatch Mountains. This country, 200 miles wide, is fairly represented by Mr. Stansbury, who accurately surveyed it, as consisting of "Artemisian barrens, with some pasturage on the streams." The water is bitter, sulphurous, or strongly saline; the earth is for the most part bare and rugged, showing the wear and tear of ages, and the cracks and fissures of the more recent water-courses. A more forsaken region I never saw.

The Wahsacht belt of mountains is sixty miles across, and the dividing ridge which separates the waters of Green River, which flow into the Californian Gulf, from the tributaries of Great Salt Lake, is crossed within the first twenty miles, without any heavy grades, at an elevation of 7,567 feet. Nature has herself cut a path through the remaining forty miles of mountain by means of two fine gorges, Echo and Weber cañons. Without the intervention of these extraordinary natural passes, the Wahsatch Mountains would have formed an insurmountable barrier to a railroad. The railroad thus reaches the shore of Great Salt Lake, thirty miles north of the Mormon city. It does not pass through this town, but turns northward around the lake, and then, bending westward, leaves the Salt Lake Basin and enters that of the

Humboldt; the rim separating these basins being here but ,360 feet above the Lake.*

The inland or Great Basin region of North America extends rom the dividing ridge of the Wahsatch Mountains to the summit of the Sierra Nevada, 721 miles by the railroad. It is a vast desert, considerably larger than France, covered with short volcanic mountain ranges; it possesses a fertile soil, but suffers from an insufficient rain-fall; none of its scanty streams enter the sea, but each discharges its waters into a little lake and remains shut up within its own independent basin. Rich silver mines are being discovered, year by year, all over the basin region, and the yield from them already equals in value that of the gold-fields of California. It contains three towns, Salt Lake City, Austin, and Virginia City; the railway passes within thirty-five miles of the first, 100 miles of the second, and sixteen only of the last.

The railroad follows the valley of the Humboldt River, from Humboldt Wells, north-west of Great Salt Lake, where it rises, to Humboldt Lake, not far distant from its "sink" (distance 280 miles), and reaches the base of the Sierra Nevada 100 miles farther westward.

From the Truckee River, elevation 5,866 feet, to the summit of the sierra, the distance is fourteen miles, and the ascent 1,176 feet, making an average grade of 84 feet per mile. From the summit, elevation 7,042 feet, to Colfax, on the western side of the range, the distance is fifty-one miles, and the descent 4,594 feet, or an average grade of over 90 feet per mile. In fact, the Central Pacific Railroad, starting from the Sacramento, only 56 feet above the level of the sea, reaches the summit of a mountain ridge exceeding 7,000 feet in 105 miles. Here all the engineering difficulties of the

* Elevation of Great Salt Lake, 4,290 feet.

line centre. Most of the heavy grading averages 95 feet per mile; for three and a half miles only is 116 feet, the maximum grade allowed by Congress, resorted to; there are thirteen short tunnels, making altogether a length of 6,262 feet. The longest is 1,700 feet. It is a very hard strain upon two powerful engines to drag ten passengers' cars with luggage up so steep an ascent, and the carriage of heavy freight is necessarily costly.

This bold undertaking has been carried out with an amount of energy beyond all praise. The road has been built, not by a staff formed of scientific engineers—they might have shrunk from so reckless a venture—but by a few go-ahead merchants of San Francisco, who left their counting-houses to become railway contractors. All last summer ten thousand Chinamen and about three thousand teams, were employed to grade and lay the track across the basin region. During the previous winter I saw them transporting long lines of sledges, laden with iron rails and ties, across the summit to the valley of the Truckee and the Humboldt. When the snow had sufficiently thawed to enable them to complete the tunnels, an average of 500 tons of ties, rails, spikes, bolts, and chairs were carried over the sierra, in fifty cars drawn by ten locomotives every day, and were sent from 300 to 400 miles to the scene of operations. Here two miles, and sometimes more, were laid per day, and each two miles required 500 tons of material for its construction. The rails usually weigh from 56 lbs. to 64 lbs. per yard.

For thirty miles across the mountains the snows of winter presented an obstacle which at first seemed to be insurmountable, but these Californians would not give in; they have covered the line with strong wooden sheds over the entire distance in which snows are likely to stop the traffic, and had

ompleted twenty miles of roofing on the 1st of January his year. It is hard, after so much has been done, to be bliged to pronounce this summit railway a mistake. Yet here is no question about it. Had the Sierra Nevada been more thoroughly examined before this gigantic enterprise was undertaken, Beckworth's Pass—thirty miles to the north, and only 4,500 feet in height—would most certainly have been adopted. So expensive is it to carry freight up such steep grades for so great a distance, that although the Central Pacific Company at present ignore the Beckworth route, they will be obliged ultimately to adopt it if the freight traffic at all equals their expectations. Although the engineering difficulties upon other points of the Pacific Railroad are not great, yet the rapidity with which the work has been accomplished is marvellous. It was not until January, 1866, that the first forty miles of railroad were laid down from Omaha; in January, 1867, 305 miles were completed; and in January, 1868, 540. In the meantime the Californian Company were hard at work tunneling, and had only ninety-four miles open to business on the 1st of January last year.

During 1868, 866 miles were added to the railway by the united companies; being an average of two miles and two-thirds a day, Sundays excluded, and the remaining 346 miles were completed in 107 days more. In the history of railway construction this rapidity has no precedent; and when it is remembered that for 1,600 miles wood for ties could only be obtained at three points accessible to the road, and also that the country is mostly an uninhabited desert, the result appears even yet more marvellous. The following quotation explains, in true American style, how the track is laid:—

"One can see all along the line of the now completed road

the evidences of ingenious self-protection and defence which our men learned during the war. The same curious huts and underground dwellings which were a common sight along our army lines then, may now be seen burrowed into the sides of the hills, or built up with ready adaptability in sheltered spots. The whole organisation of the force engaged in the construction of the road is, in fact, semi-military. The men who go ahead, locating the road, are the advance guard. Following these is the second line, cutting through the gorges, grading the road, and building bridges. Then comes the main line of the army, placing the sleepers, laying the track, spiking down the rails, perfecting the alignment, ballasting the rail, and dressing up and completing the road for immediate use. This army of workers has its base, to continue the figure, at Omaha, Chicago, and still farther eastward, from whose markets are collected the material for constructing the road. Along the line of the completed road are construction trains constantly 'pushing forward to the front' with supplies. The company's grounds and workshops at Omaha are the arsenal, where these purchases, amounting now to millions of dollars in value, are collected and held ready to be sent forward. The advanced limit of the rail is occupied by a train of long box cars, with hammocks swung under them, beds spread on top of them, bunks built within them, in which the sturdy, broad-shouldered pioneers of the great iron highway sleep at night and take their meals. Close behind this train come loads of ties and rails and spikes, &c., which are being thundered off upon the roadside, to be ready for the track-layers. The road is graded a hundred miles in advance. The ties are laid roughly in place, then adjusted, gauged, and levelled. Then the track is laid.

"Track-laying on the Union Pacific is a science, and we

pundits of the Far East stood upon that embankment, only about a thousand miles this side of sunset, and backed westward before that hurrying corps of sturdy operatives with mingled feelings of amusement, curiosity, and profound respect. On they came. A light car, drawn by a single horse, gallops up to the front with its load of rails. Two men seize the end of a rail and start forward, the rest of the gang taking hold by twos until it is clear of the car. They come forward at a run. At the word of command the rail is dropped in its place, right side up, with care, while the same process goes on at the other side of the car. Less than thirty seconds to a rail for each gang, and so four rails go down to the minute! Quick work, you say, but the fellows on the U. P. are tremendously in earnest. The moment the car is empty it is tipped over on the side of the track to let the next loaded car pass it, and then it is tipped back again; and it is a sight to see it go flying back for another load, propelled by a horse at full gallop at the end of 60 or 80 feet of rope, ridden by a young Jehu, who drives furiously. Close behind the first gang come the gaugers, spikers, and bolters, and a lively time they make of it. It is a grand Anvil Chorus that those sturdy sledges are playing across the plains. It is in triple time, three strokes to a spike. There are ten spikes to a rail, four hundred rails to a mile, eighteen hundred miles to San Francisco. That's the sum, what is the quotient? Twenty-one million times are those sledges to be swung—twenty-one million times are they to come down with their sharp punctuation, before the great work of modern America is complete!" (See title-page, vol. i.)

Passing over all other collateral subjects, I must mention that an abundance of coal, sufficiently good to be burned by the locomotive, has been discovered in several localities near

the railroad, viz., in the Black Hills, 550 miles from Omaha; near Bridger's Pass, 130 miles farther west; on Bitter Creek, and some other branches of Green River; and lastly, some fine deposits are now being mined in Echo Cañon. None has been found between Great Salt Lake and the Pacific coast.

It has long been the opinion, however, of many railroad men in the States, that this great national highway should not have been constructed along the 41st parallel at all; and they have anxiously awaited the results of last winter's experience to prove or disprove the truth of their forebodings. The Senate Committee, in their Report just issued on the Pacific railways, say that "It is an undetermined problem if the Union Pacific Railroad between Omaha and Sacramento can be operated (*i.e.* 'worked') throughout the year. Of the elements to solve this question there are: First, the known effects of drifting snow upon the railway lines of Central Illinois, and the hilly districts of New England and Pennsylvania; second, the known depths to which snow falls and packs in portions of the Rocky Mountain region; third, the extraordinary height of the grades, and sharpness of the curves, in the passage of the Sierra Nevada. Railroad communication in Massachusetts, New York, and Pennsylvania, is often suspended in winter. These vicissitudes take place in States where labour is abundant, where the stations on the lines are very near together, where fuel and food, draught animals and tools, are plentiful and accessible. But the line between Omaha and Sacramento is at present almost a continuous wilderness—portions of it never will be settled; population is scarce; help in trouble, beyond that of the passengers and *employés* on the train, cannot be had; the stock of accessible fuel may be limited to the supply on the cars. If such interruptions should take

place, their effect upon the new trade from Asia to Europe across the United States, would be very damaging; they would characterise the route as one not to be relied on for international commerce."

It is comparatively easy to roof the line across a snow-belt of thirty miles through the Sierra Nevada, where timber is abundant; it is impossible to cover 300 miles of rail in the Rocky Mountains, where timber is either entirely absent or very scarce. As I remarked in a preceding chapter, I could not proceed eastward by the Platte route in March, 1868, even from Cheyenne City, on the plains, and was obliged to proceed southward by Denver, and strike the Kansas Pacific. The latest accounts from America confirm the gravest doubts of the Senate committee.

Last February there was a snow blockade for twenty days at Cheyenne, and on the Laramie plains traffic was completely stopped for five weeks, so that orders had to be given for all mails from New York to San Francisco to be sent for the time round by Panama.

Can anything be much more miserable than to be snowed up for a month in the Bitter Creek country? Yet this did occur as late as last March; fifty of the passengers arrived at Laramie Station, after walking ninety miles through the snows, at an elevation of over 7,000 feet above the sea; 150 passengers were left behind, and had not been rescued at the time I received the above information, although on April the 1st through traffic had not been resumed.

CHAPTER III.

THE KANSAS PACIFIC RAILWAY.

The more advanced of the two Pacific railroads yet to be described is that which passes through districts already made known to my readers in previous chapters; it is therefore unnecessary for me to go over the ground a second time.

The Kansas Pacific Company has completed more than 400 miles of road, reaching to the borders of Colorado, and expects to complete its branch through Denver to the Omaha line, a distance of 321 miles farther, within the present year.

In the meantime, the Southern Pacific of California, which stands in the same relation to the Kansas Pacific as the Central Pacific of California does to the Union Pacific (or the Omaha line), had laid eighty miles of road in March, '69, and is fast "locating" a further section, which is to pass through the Panoche Pass, in the coast range, into the Tulare valley, and west of Tulare Lake to Tehachapa Pass, in the Sierra Nevada.

The Report of all the surveys referred to in this book has just been published, and now lies open before me, forming a small volume of 250 pages; not written in the high-flown, exaggerated manner of too many documents of a similar nature which we yearly receive from America, but full of information, which, although usually too condensed, is forcibly put and justly represented.

So extensive a surveying expedition was probably never

rganised. The total length of routes accurately chained, evelled, and surveyed by instruments, is no less than 4,464 iles; and a considerable distance more was examined, nd the various elevations barometrically obtained. These

	UNION PACIFIC RAILWAY.	Distances. Miles.	Elevations. Feet.	Elevations. Feet.	Distances. Miles.	KANSAS PACIFIC RAILWAY.	
Mississippi Basin.	Missouri River at Omaha		968	543		Missouri River at Kansas City	Mississippi Basin.
	Forks of the Platte	290	2,830	3,725	525	Arkansas River at Fort Lyon	
	Foot of Black Hills	228	7,040	4,266	50	Mouth of Chequaco Valley	
	Evans' Pass	31	8,242	6,166	40	Cimarron Pass (Raton Mtns.)	
				5,634	64	Red River	
				6,233	76	Los Vegas	
	Laramie River	30	7,175	5,406	26	Rio Pecos	Rio Grande Basin.
	Rattlesnake Pass	35	7,560	6,917	30	Cañon Blanco Pass	
	North Platte	54	6,695	5,000	60	Rio Grande del Norte	
	Bridger's Pass	23	7,534	7,177	122	Navajo Pass (Campbell's)	
Colorado Basin.	Bitter Creek	97	6,315	4,998	118	Colorado Chiquito	Colorado Basin.
	Bitter Creek Summit	13	7,175	7,510	102	Leroux Summit	
				4,748	89	Val de Chino	
				5,241	39	Yampa Gap	
				3,473	61	Wallapi Pass	
	Green River	20	6,092	428	49	Rio Colorado	
	Reed's Summit	75	7,567	2,579	40	Pi-Ute Pass	
Great Basin.	Bear River	30	6,045	675	36	Perry Basin	Great Basin.
	Echo Pass	18	6,879	2,100	59	Crater Pass	
	Great Salt Lake	127	4,290	1,900	10	Malpais Sink	
	Humboldt Wells	130	5,650	2,375	25	Mojave River	
	Humboldt Lake	283	4,047	3,080	65	East foot of Sierra Nevada	
	Donner Pass (crest)	123	7,042	4,008	15	Tehachapa Pass	
Pacific.	Sacramento	105	56	700	145	Polvodero	Pacific.
				2,100	15	Summit of Coast Range	
	San Francisco	124	...	...	165	San Francisco	

CENTRAL PACIFIC OF CALIFORNIA.		SOUTHERN PACIFIC OF CALIFORNIA.	
Total distance	1,846 miles.	Total distance	2,026 miles.
Between New York and San Francisco *viâ* Salt Lake	3,300 miles.	Between New York and San Francisco *viâ* shortest and easiest route by lat. 35°	3,252 miles.

xplorations were conducted, be it remembered, mostly rough a country inhabited by hostile Indians; every party ad to be guarded whilst at work by a body of cavalry; and

every surveyor carried his firearms by his side, and his surveying instruments in his hands.

The results of these surveys are most encouraging, and prove conclusively that a railroad can be made, uniting St. Louis with San Francisco, along the 35th parallel of latitude, which shall form a shorter route between New York Harbour and San Francisco than that *vid* Salt Lake. Not a tunnel is required throughout the entire distance; and although the ascents and descents are many, the grades are never of necessity steep. Obstruction from snow is unknown; and the Sierra Nevada, instead of requiring thirteen tunnels, and grades varying from 95 to 116 feet per mile, is crossed at an elevation of 4;008 feet without any ascent steeper than half the latter grade. The two routes can easily be compared by means of the table on the preceding page.

Each line, although usually separated from its rival by a belt of country ranging from two to six and a half degrees in width, passes across corresponding river-basins, ranges, and streams; the basin of the Rio Grande del Norte, which does not extend as far north as the Salt Lake line, being the only exception.

Eastern Kansas, Western Kansas, the valleys of the Arkansas, Purgatoire, Red River, and Rio Grande del Norte have all been described; the country along the 35th parallel, the beautiful districts about the San Francisco peaks, and the arid desert between the Rio Colorado and the Sierra Nevada have also been mentioned in detail; and the mineral wealth of New Mexico, Arizona, and California have not been altogether passed over. The conclusion I have arrived at is similar to that which Mr. Davis has stated in his report for 1855, viz., that "a much larger area of cultivatable lands, and a greater frequency and extent of forest growth, exist between

the Rio Grande and the Colorado, on the 35th parallel, than on any other latitude throughout the western territories of the United States."

Personally, I have no interest whatever in railway enterprises in America; yet, for fear of being considered unjustly partial, I almost think I have under-coloured rather than otherwise the natural resources of this tract of country; and as my friend General Palmer is quite incapable of any attempt at exaggeration in these particulars, I will give the deductions he has arrived at in his own words:—

"To sum up this subject, it may be said:—

"1st. That while the western half of the continent is not an agricultural Paradise, yet, certainly on this route, it is far from being a desert, as many have supposed. That it has been shown to be almost continuously inhabitable, and that there are frequent and extensive districts of great attraction to the farmer; while to the grazier, except in the Great Basin, it presents one vast, uninterrupted belt of uniformly superior pasturage, extending from Kansas to the Pacific Ocean, on which horses, mules, cattle, and sheep can be raised in countless herds, as cheaply, perhaps, as anywhere in the world.

"2nd. That the mildness of the climate on this parallel greatly enhances the value both of its arable and pastoral resources, enabling more than one crop to be raised in a season, permitting stock, without care, to fare as well in winter as summer, and adding the vine, cotton, and other semi-tropical fruits or products to those of our temperate latitudes. On the survey, we drove our beef cattle along in the winter season, and always found for them and for the mules of our trains abundant nutritious grazing, on the highest summits of the line equally with the deepest valleys.

"3rd. That although, for nearly the whole of this distance, irrigation is resorted to, yet, by more thorough cultivation, it is likely that, at many points, this will not be required. Besides, irrigation is not necessarily a drawback, since it enables the farmer, to a great extent, to be independent of the seasons, serves to enrich his grounds by the constant sediment with which the water is charged, and, with a properly organised plan, is not costly; while the crops are made to yield much more bountifully, as a general thing, than in the Mississippi valley. The quality of the wheat grown in these elevated valleys and dry atmosphere is most highly prized, especially for transportation.

"Lastly. That the hills and mountains over this extended range contain an amount of mineral wealth of all kinds, the useful as well as the precious, which may be considered practically inexhaustible. Furthermore, that these subterranean treasures are not confined to a few localities far apart, but have a remarkable diffusion along the route. Indeed, from the Arkansas River to the western spurs of the coast range, near San Francisco, a distance of 1,500 miles, the mountains, which are never out of sight, may almost be said to possess continuous deposits of one kind or another of valuable minerals, which, beginning with the coal and iron of Colorado, end only with the quicksilver of New Almaden.

"When it is remembered how little and how carelessly this vast territory, the home of savage Indians, has been explored by white men, and that, even in the small and old-settled district of Cornwall, where mining was carried on before the Christian era, and where the earth has been burrowed for ages at a great depth, new discoveries are still made of tin and copper lodes, we may well wonder at the amount of hidden treasures which the few disclosures already made would indicate."

CHAPTER IV.

It is quite impossible to weigh the advantages held out by the Northern Pacific route without becoming a convert to the scheme. By making use of the Great Lake system of the continent and the rivers which flow east and west above the meridian of New York, it would be possible to pass from that city to Portland on the Pacific, 3,205 miles, by steamboat for 2,480 miles, and by rail for the remaining 825. The object of the Northern Pacific Railroad is not only to develop the country through which it passes, but to unite the following great steamboat routes with one another:—

1st. The Great Lakes at the western end of Lake Superior.

2nd. Steam navigation on the Mississippi by a short branch to St. Paul.

3rd. Steam navigation on the Missouri at Fort Clarke and Fort Benton.

4th. The Columbian River, from the falls of which one branch is to continue onward to Portland at its mouth, another to deflect northward to Seattle, in Puget Sound. Here the advocates of this route say that they are nearly 500 miles nearer to Shanghae than at San Francisco, and that the distances to the ports of Japan, Northern China, and the Amoor are still more in their favour.

The following table gives the elevations and distances :—

THE NORTHERN PACIFIC RAILWAY.

Highest intermediate grades.		Distances in miles.	Elevations in feet.	
No high grades.	Lake Superior	...	600	Lake Superior Basin.
	Dividing Summit	32	1,158	
	Mississippi River	111	1,152	Mississippi Basin.
	Hauteur des Terres	177	1,419	
40	Red River	232	985	
...	Plateau du Coteau du Missouri	365	2,400	
40	Missouri River	485	1,800	
...	Dividing Summit	625	2,500	
40	Yellow Stone River	675	2,100	
30	Point of Judeth Mountain	936	3,495	
70	Cadott's Pass*	1,115	5,337	
70	Flathead River	1,225	2,410	Columbia River Basin.
40	Pend d'Oreille Lake	1,355	2,020	
30	Summit	1,405	2,620	
30	Spokane River	1,405	1,720	
40	Summit	1,425	2,380	
40	Columbia River	1,535	430	
...	Portland	1,755	...	
40	Columbia River	1,535	438	
50	Snoqualmie Pass	1,694	3,325	
90	Base of Mountains	1,738	175	Puget Sound.
	Seattle	1,775	...	
	Mean elevation above the sea	...	2,215	

Distance, in miles from New York, *viâ* Great Lakes to Portland, 3,285 miles.
Mean annual temperature, 50° Fah.

As I have never traversed the route proposed for this railway, I extract the following quotation from the Report already referred to of the Senate Committee on Pacific Railroads, dated February 19th, 1869, as I presume no better authority could be obtained.

"There are between Lake Superior and Puget Sound and the mouth of the Columbia River 500,000 square miles of territory, upon the larger portion of which the United States' Government can impress prosperity, wealth, and power, like

* This pass is supposed to require a tunnel 2½ miles long.

that of Illinois. It is the winter-wheat region of this continent. It is a region of alternate prairies and pine forests. It is a region rich in coal, iron, gold, silver, and copper. It is a region the salubrity of whose climate has made it the sanatarium for consumptives from the Atlantic slopes. It is a region whose Rocky Mountain section, broken down in its formation so as to be passable by loaded ponies, is blessed with a temperature so mild that countless herds of cattle range and fatten through the winter upon the natural grasses within ten miles of the summit of the continental water-parting. It is a region in all whose valleys peaches, apples, pears, plums, cherries, grapes, and sweet potatoes have rapid growth and complete maturity. It is a region so rich in grass, and so blessed in climate, that it has ever been the home, in winter as well as summer, of the buffalo, the elk, and the antelope. It has timber, water-power, and stone. It has a population of 1,410,000 people. Illinois possessed no such endowments. Her inheritance, so amazingly developed by railroads, was a garden soil, deeply underlaid with a thin seam of coal and a deposit of friable sandstone. She had nothing else. But every element of wealth, every condition of social growth and prosperity exist in superabundance and beyond exhaustion in the territory between Lake Superior and Puget Sound. For this immense region, embracing Minnesota, Dakota, Montana, Idaho, Oregon, Washington, and a part of Wisconsin, railroads can do more than they have done for Illinois."

The statement made in the above quotation as to climate may appear strange to those who are unacquainted with the great bend northward which the isothermal lines make west of the Mississippi. The winters are long and severe in Minnesota, but a little farther west, the proposed railroad enters a

much warmer region. Half-way between Chicago and the Pacific the same average temperature is found to exist in latitude 50°, more than three degrees north of the proposed line, as is experienced eight degrees farther south in Illinois and the regions east of that State. Hence the agricultural value of our Saskatchewan settlements.

The northern line will always have to contend against one great drawback, that is the closure of Lake Superior to traffic for seven out of twelve months every year. Neither this inland sea nor Lake Michigan become frozen over, but most of their harbours, and especially their shallow entrances, are always rendered impassable for from five months in the lower basin, to seven, and sometimes eight, in the upper.

Whilst we are languidly considering whether it is or is not to our advantage to unite our Pacific and Atlantic North American colonies by a national railroad across Canada, the Americans will very probably settle the question for us in a way which will not be altogether flattering to our national pride. On this subject the same Report observes:—

"The line of the North Pacific road runs for 1,500 miles near the British possessions, and, when built, will drain the agricultural products of the rich Saskatchewan and Red River districts east of the mountains, and the gold country on the Fraser, Thompson, and Kootanie rivers west of the mountains. From China (Canton) to Liverpool it is 1,500 miles nearer by the 49th parallel of latitude than by the way of San Francisco and New York. This advantage, in securing the overland trade from Asia, will not be thrown away by the English, unless it is taken away by our first building the North Pacific road, establishing mercantile agencies at Puget Sound, fixing mercantile capital there, and getting possession, on land and on the ocean, of all the machinery of the new

commerce between Asia and Europe. The opening by us first of a North Pacific railroad seals the destiny of the British possessions west of the 91st meridian. They will become so Americanised in interests and feeling that they will be in effect severed from the new Dominion, and the question of their annexation will be but a question of time."

CHAPTER V.

FUTURE PROSPECTS.

Will the Pacific railroads pay?

The traffic receipts, and the deductions to be drawn from other considerations, lead us to believe that they will pay well; we must, however, bear in mind that facts, as well as figures, can be so represented as to prove almost anything in cases such as these, and that time alone will show what will be the fate of undertakings which have had as yet no precedents.

The Union Pacific Company thus states its earnings and expenses for the year ending June 30th, 1868, on an average length of 472 miles.

Earnings.

	Dollars.
Passengers	888,335
Freight	3,233,371
Express	30,955
Mails	66,800
Miscellaneous	26,579
	4,246,040

Expenses.

	Dollars.
Conducting transportation	517,803
Motive power	977,011
Maintenance of cars and ways	1,040,688
General expenses	149,255
	2,684,757
Balance	1,561,283
Interest on 1st Mortgage Bonds	631,680
,, Government Bonds	451,200
Surplus	478,403

But here it certainly appears that the transmission of construction material over the road has been charged to the item of freight, thus making the company itself the best customer.

The local traffic between the State of California and the interior mining towns of the Great Basin is already very great, and likely to be enormous; the manufactures and wares consumed in Oregon, Washington, Columbia, Idaho, and Nevada, are nearly all drawn thence; and so rapidly are the Pacific States and Territories increasing in population and wealth, that three railroads across the Sierra Nevada would soon have as much work as they could well take over a single line of rails. The Central Pacific Company of California is now demanding 10 cents per mile for passengers, and 15 cents per ton per mile for freight—charges which, paid in gold, are too exorbitant long to be maintained.

The year's business on the Kansas Pacific Road for 1868, over an average length of 403 miles, stands thus:—

	Dollars.
Earnings.	
From transportation	1,910,161
From land sales	255,205
	2,165,366
Expenses.	
Traffic, maintenance, &c.	1,036,494
Interest on 12,800,000 dollars, with Bonds at 6 per cent.	720,000
	1,756,494
Surplus	408,872

The operating expenses were equal to 54 per cent. of the gross receipts. Although the transportation of construction material may have been added in this case also, yet, as the extension of the road westward was suspended, this item must have been small. The 400 and odd miles of road opened

during these periods ended in both cases in the uninhabited wilds, and could scarcely have been expected to pay their way at all. Yet the results are most encouraging. Now that the line from San Francisco to Omaha is open throughout, we shall soon learn the solution of the problem. Experience has taught that, although the through traffic is generally most relied upon in the establishment of a line, it is the local traffic which proves in the end to be the most important. Mile for mile, the local traffic must be small throughout four-fifths of the distance between Omaha and San Francisco, unless a large business is done in the transportation of ores; yet the through traffic ought, in this exceptional case, to compensate fully for the deficiency. Fifteen hundred miles of country separate a thriving population of thirty-two millions from an equally wealthy and flourishing community inhabiting California, as well as the great producing nations of Asia—China and Japan.

Even the passenger traffic to and from the Pacific coast must be enormous, and all will probably pay at least 6 cents per mile (from 2*d.* to 3*d.*) upon the entire distance. If the central line pays, the financial success of the southern one is certain, for the local traffic will rapidly increase as the comparatively fertile districts along the route become colonised; the through traffic will at least be shared on equal terms, and probably the absence of impediments from winter snows will give the latter in the end a decided advantage. The prospects of the northern route rest upon rather different grounds, and cannot yet be fairly judged; politically, it may be very desirable that the American Government should subsidise this road also, for reasons already referred to; and one fact is certain, that, whether these undertakings are destined to pay at once, or after many years, they will

immediately be of infinite service to the Government, by settling the Indian question, by adding to the taxable wealth of the nation, and by increasing to an enormous extent the yield of precious metals.

The Bill returned this spring to Congress from the Senate Committee proposes, by its comprehensiveness, to dispose finally of the Pacific Railroad question. Its opponents call it the "Pacific Omnibus Bill," others stigmatise it as "the great railroad job." It seems, however, to an unprejudiced observer to form a part of that far-sighted policy which the Government of the United States has ever followed in relation to the development of its vast territories, and forms another convincing proof of the wonderful success obtained by railroad extension as a means of colonization.

No less than seven railway companies are recommended for subsidy in the Bill, representing a combined length of railroad exceeding 4,570 miles.

	Computed Miles.*
The Northern Pacific Railroad	1,770
The Atlantic and Pacific	640
The Little Rock and Fort Smith	160
The Kansas Pacific	400
The United States' Southern Pacific	650
The Southern Pacific of California	524
The Oregon Branch of the Central Pacific	500

These, however, only represent different sections of the three great routes which have been described. The Atlantic and Pacific, and the Little Rock and Fort Smith are to form a continuous line, uniting the railways of the Southern States with the trunk line of the 35th parallel, and to meet the Kansas Pacific at a point east of the Rio Grande in New Mexico, where both are to unite their forces in building the United States' Southern Pacific.

Again, the Southern Pacific of California is to construct

* These distances are exclusive of any sections of line already built.

the trunk line from San Francisco and to meet the above about the Colorado River.

The Northern Pacific has at present no other company to share its task. The last line is a branch from the Humboldt valley to Portland, uniting Oregon with the Central Pacific route; it does not, therefore, directly form part of any of the trans-continental routes.

One point of importance in the Bill is a change in the mode of granting the subsidy. Instead of issuing to the railway companies Government six-per-cent. bonds, varying in amount with the supposed difficulties of construction, the same system is proposed as we have adopted with our East Indian railways, viz., a Government guarantee of six per cent. upon the capital stock of each company. Very stringent measures are proposed in order to guard against the Government aid being misapplied, as well as to ensure prompt payment of the interest.

If the Bill is carried, the Pacific and Western States, as well as the Territories lying between them, will be provided with a railway system so complete in itself that the development of these enormous regions must proceed with a rapidity never before witnessed. Five years is the time named for the completion of all these railroads, and there is little doubt but that this short space is sufficient.

From two points of view, we as a nation, and, in fact, all Europe, are immediately and closely interested in all these railroad projects. In the first place, we are led to inquire whether the main currents of trade between Europe and the East—China, India, Japan, New Zealand, and Australia—will be shifted into new channels. In the second place, emigration will certainly be systematically encouraged upon so large a scale that we are likely to lose no inconsiderable

proportion of our surplus labour. If these railway enterprises are completed in five years, they will open almost as large a field for emigration as the discovery of a new continent with a circumference equal to the combined length of the railroads in question—4,644 miles; for, without highways for transportation of produce, land is comparatively valueless to the colonist.

Let us first inquire to what extent the existing currents of European traffic will be affected.

The improvements now in progress along the present lines of travel between Europe and the East must be weighed against the new routes across North America.

Trade between Europe and our Indian empire will not, of course, be affected. Our trade with China requires a little consideration. For quick passenger traffic, the completion of our railroad system across India will cause the following results:—

	Vid Marseilles and Bombay.	*Vid* New York and San Francisco.
London to Hong Kong	39 days	47 days.
Shanghae	43 ,,	43 ,,

Some of the passenger traffic to China, therefore, will certainly avoid the tropics and go by San Francisco. The passage of freight, however, is somewhat different.

The handling of goods is so expensive an item that nearly all the valuable productions of China come to us in clipper-ships round the Cape. Merchandise which can afford to pay the additional tax of a quick passage will be carried in steamers through the Suez Canal, and save a distance exceeding 4,000 miles of sea. Very little traffic goes to China by Panama; none will cross the American continent when the Suez Canal is open to navigation. If the import duties at New York were not so heavy, it is far more likely that the

Eastern States would continue to receive the silks and teas of China from us, than that the latter should come to us through them.

Passenger traffic with Japan and New Zealand will probably be diverted into the new channel:—

	Viâ Marseilles and Bombay.	*Viâ* New York and San Francisco.
London to Yokohama	48 days	38 days.

Again, the shortest route to New Zealand is *viâ* Panama; but San Francisco is 700 miles nearer New Zealand than Panama is, and already the line of steamers which did run between Panama and New Zealand has been discontinued, and a line from San Francisco established instead. We shall be able, in fact, to go from London to Wellington in thirty-seven days, thus:—

London to New York	10 days.
New York to San Francisco	6 ,,
San Francisco to Wellington	21 ,,
Total	37 ,,

Our Australian goods traffic will not be affected, and but few passengers will incur the increased expense of a long land journey by crossing North America.

CHAPTER VI.

EMIGRATION.

Whilst emigration is actually being opposed in some of our own colonies, the Americans are demanding with greater force than ever more hands and more brains.

"It can be shown by official records," says the Report before mentioned, "that the Kansas Pacific, the Union Pacific, and the Central Pacific have been instrumental in adding hundreds of thousands to the population of the States of Kansas, Colorado, Iowa, Nebraska, California, and Nevada. Minnesota owes to the rapidity and cheapness of transportation by rail her best immigrants—over 100,000 Germans, Norwegians, and Swedes. Every foreign labourer landing on our shores is economically valued at 1,500 dollars. He rarely comes empty-handed. The Superintendent of the Castle Garden (New York) Emigration Depôt has stated that a careful inquiry gave an average of 100 dollars, almost entirely in coin, as the money property of each man, woman, and child landed at New York. From 1830, the commencement of our railway building, to 1860, the number of foreign emigrants was 4,787,924. At that ratio of coin-wealth possessed by each, the total addition to the stock of money in the United States made by this increase to its population was 478,792,400 dollars. Well might Dr. Engel, the Prussian statistician, say—'Estimated in money, the Prussian State has lost, during sixteen years, by emigrants, a sum of more than

180,000,000 thalers. It must be added that those who are resolved to try their strength abroad are by no means our weakest elements. Their continuous stream may be compared to a well-equipped army, which, leaving the country annually, is lost to it for ever. A ship loaded with emigrants is often looked upon as an object of compassion. It is, nevertheless, in a politico-economical point of view, generally more valuable than the richest cargo of gold dust.'

"The Kansas Pacific Railway Company has organised immigration to its lands. It has agents in Europe who tell of the resources of Kansas, and induce people to seek a home there; aiding them, if necessary, to cross the Atlantic and to reach that State by rail, and selling them lands on long credit. This liberal and wise example will be followed. Let the Northern and Southern Pacific railroads and the Homestead-law go together across the Continent; and in less than ten years we shall see upon the lines of those roads and their outlets at least three millions of the best population of Northern Europe—farmers, graziers, mechanics, and miners. Reckon up their worth at 1,500 dollars a head; add to the product the quantity of coin they will bring, 100 dollars each person; then say if, in 4,800,000,000 dollars added to the wealth of the country, our Government cannot find authority and courage to guarantee the interest of the bonds issued to assist in building the roads."

Although the Prussian statistician mourns over the loss of his emigrating countrymen, we in England are not justified in joining him in his regrets. The long-continued misunderstanding between capital and labour which exists in this country has done much to assist other European nations in raising their manufactories to a level with our own. We are no longer the workshop of the world. We have more cotton-

mills, more machinery, more iron-works, and more operatives than are required to supply the markets dependent upon us. We require depletion. The abject poverty which now stares us in the face is becoming unendurable. How can our destitute artisans educate their children when they are clothed with rags?—or what do starving parents care for school reform? Equilibrium between the demand and supply of labour must be attained; and wholesale emigration is the only means by which this can be accomplished.

The fact of the United States being a foreign country ought not to affect the question in the least. Canada, Australia, New Zealand, all or any one of our colonies may soon become independent of the mother country; and perhaps it is better for both that they should before long dissolve partnership. It is, however, our desire, and also greatly to our advantage, to remain on the best terms with our American neighbours. With one section of them—the emigrant Irish—this is at present impossible. They hate us so intensely that, were it possible for them to gain the ascendency, war would surely follow. It should therefore be our aim to maintain the ascendency of the Saxon and Teutonic elements in States.

The Americans complain of our gross ignorance as regards their politics, institutions, and social life; and although they are probably right in this accusation, our ignorance of them certainly finds a counterpart in their ignorance of us. If the North was not unanimous in its views as to the desirability of carrying on war with the South, how could they expect us all to be of one mind? Yet most Northerners believe that we sided altogether with the South, and they look upon us as enemies in consequence. Again, if they had carefully watched the state of public opinion here since the war, they would have perceived that if parties in England were pretty

evenly balanced in private sentiment with respect to the struggle when it was in progress, the direction which public opinion has since been taking is towards the Republican party and the policy of the North.

This drifting of the majority of Englishmen towards acquiescence in the unity and prosperity of the States will receive a severe check if the American Government perseveres in its most unjust treatment of the Alabama question; for it will convert many to the opinion that perhaps, after all, we should have done ourselves and the world generally a great service by assisting in the partition of the Union instead of remaining strictly neutral in the quarrel. If the Americans insist upon keeping up ill-feeling by refusing to settle amicably these outstanding claims; if they continue to make mountains of molehills, and think it worth while to risk a war, which would be thrice as expensive as that which they have just waged, for the sake of gratifying a vague feeling of jealousy which has no real foundation, they will receive from us but very few emigrants and very little capital.

So much has been said and written, even within the last few months, on emigration, that I will not attempt to discuss the subject in detail; but I have, in conclusion, one simple scheme to propose, which I consider eminently practical, and which is the result of much reflection and of some experience.

A would-be emigrant generally finds it almost impossible to obtain reliable information; he knows nothing, as a rule, of distant lands; and those, unfortunately, to which he proposes himself to go, lie far away on the outskirts of civilisation, and quite beyond the beaten track of ordinary travel. He knows nothing of the expense, nothing of the requirements, nothing of the chances of success or failure, and it often happens that when he has reached the country of his

adoption he goes to ruin before he has had time to learn how to live there. A wise man, on emigrating, generally asks himself this question—"How can I support life, and keep the little capital I have (supposing he is not quite destitute) until I learn how the land lies?" Thousands stop at home in misery and want because they cannot answer this question, and dare not take this first step in the dark. Suppose there were established in London, in connection, say, with a central committee on emigration, a newspaper (call it *The Emigrant*) devoted to the subject, and an office to which all who desired could apply, we should be able in time to supply much of the information required.

The editor of *The Emigrant* would be able to assist all parties, first by publishing, under authority, so to speak, reliable information of every kind bearing upon the subject, and, secondly, by bringing interested parties—shippers, agents for land and railway companies, colonial and other Government agents, landowners, and the rest—face to face, through the advertising columns, with those who need lands and conveyance to them.

One indispensable point would have to be *reliability of information.* We must have no more British Columbia lies, such as were palmed upon us a few years ago by a "large-print" correspondent in a daily paper. Better lack of information than false statements. The advertisements should be quite distinct from the editorial part of the paper, and those which were evidently false should be omitted.

The office should be an inquiry office, and might be conducted on the general plan of our registry offices for servants. It might be made almost self-supporting by demanding a small charge for services rendered. A library and reading-room would form an indispensable branch of the establish-

ment, where colonial and other papers would be received and filed, and where books bearing on the subject, bills of sailing, fares for transportation, &c., could be found. Such kind of information would naturally gravitate thither; and if such a system were once in active operation, it could be extended indefinitely, and agencies might be planted in the countries demanding immigration, as well as in those suffering from over-population; each would work in its several capacities, the one to obtain information, the other to impart it—the one to pave the road, the other to show the way.

Employers of skilled labour would no doubt often find it advantageous to import fresh hands through this channel; they could communicate directly with the central office, and would no doubt obtain the assistance they needed.

Stock-raisers, vine cultivators, agriculturists, masons, &c., could apply also for aid, and would be able to select, within certain limits, those regions in which their particular knowledge would be of practical value. All, however, would soon learn that success as a colonist depends chiefly upon the art of readily adapting oneself to whatever kind of labour is most in demand, whether it be, as my friend at Albuquerque proved by his actions, killing sheep, editing a newspaper, or both combined.

It is unnecessary to do more than roughly sketch the scheme, for there is no difficulty in filling in the details. Such an institution should not savour of a charity; it should not patronise, but assist the emigrant; and his advancement, irrespectively of nation or politics, religion or caste, should be the sole object to be attained.

There is no lack in this country of philanthropists whose great and lifelong desire is to do good to their fellow-men. Here, then, is an opportunity for those who have time and

money at their command, and who look for their reward, not in the homage paid them here, but in the inward consciousness that they have done some service to suffering humanity.

If our great landowners, our merchants, and especially our manufacturers, do not further this great end; if we, as a nation, persist in keeping down labour by feeding millions of unproductive paupers at home, instead of helping them to find employment elsewhere, we shall richly deserve to be overpowered by that rabble form of democracy which aristocratic England dreads so much.

APPENDICES.

APPENDIX A.

BOTANY OF THE REGION ALONG THE ROUTE OF THE KANSAS PACIFIC RAILWAY, THROUGH KANSAS, COLORADO, NEW MEXICO, ARIZONA, AND CALIFORNIA.

By C. C. PARRY, M.D., Botanist to the Survey.

The native vegetation, which is the most prominent external feature that first attracts the eye of the observing traveller in a new country, is found, on a more careful examination, to afford the most direct means of arriving at those peculiarities of soil and climate that indicate its capacity for agricultural productiveness, as well as its adaptation for desirable civilised habitation. Hence lists of plants, especially in regions that have not been subjected to long experience or modification in the pursuits of agriculture, are valuable as indicating the particular class of vegetable products to which they are best adapted, or whether they are fit or unfit to reward human industry by profitable returns.

The unguarded and loose use of the term "desert," as employed, not only in popular writings, but also in scientific descriptions, has given origin to wrong impressions in reference to a large portion of our Western territories, that hold with remarkable persistence both on the popular and scientific mind. Thus, although to a certain extent the desert wastes of our old geographies are contracted, or pushed farther west into unexplored districts, the prevalent idea remains, that much of the continental regions beyond the 100° of west longitude is unproductive and unfitted for human habitation.

The readiest means of correcting this wrong impression would be to exhibit the plants which naturally grow on these supposed desert wastes; or, to one somewhat versed in the nomenclature of botany, a list of the native plants of such a district would serve at once to dispel this old and cherished illusion. Thus, let the intelligent traveller pass through Eastern Kansas in the month of September, and note the gigantic weeds and sunflowers that all but obstruct his view along the beaten road, and it will not be difficult to convince him that, where such rank annual vegetation can secure nourishment, there corn and other useful agricultural products can be raised in perfection. Or, on the great plains beyond, let him see the broad uplands bedded with nutritious grasses, and he will not be slow in arriving at the conclusion that, if only partially adapted to agriculture, it certainly possesses great pastoral capacities.

Still farther west, where mountain slopes bound rich alluvial valleys, well

watered, and displaying a luxuriant vegetation, similar in many of its aspects to what he has been accustomed to in cultivated eastern countries, he will have no hesitation in assuming that, with ordinary facilities for working the soil, still greater returns will reward his toil from the virgin sod unexhausted by protracted culture. Again, where natural forests abound, there we may reasonably expect to find all the conditions of successful tree or fruit culture; and even where many of these indications are wanting, a soil rich in mineral ingredients for the growth of plants, but exposed to the intense aridity of a rainless sky, may be restored to fertility by processes of artificial irrigation.

Thus, according to past experience, the real danger to be guarded against in estimating the productive capacity of an undeveloped country is an undue depreciation of its real value, and where definite knowledge of natural products is substituted for easy ignorance, the deserts disappear from our geographic horizon.

The list of plants herewith presented is a contribution, from one of the latest and most complete railroad surveys ever conducted on this continent, to our knowledge of the natural vegetation of the Far West. Without aiming to be complete, it is at least sufficient to show that, along the entire length of the railroad survey, extending from Kansas through South-Eastern Colorado, New Mexico, and Arizona, to the Pacific, there is an extent of habitable country, which only needs to be made easily accessible from the populous districts of the Mississippi valley and the Western seaboard, to support and maintain a prosperous and civilised population.

Commencing with Eastern Kansas, we note the rank vegetation pertaining to rich alluvial districts: the bottom-lands are occupied with a heavy growth of forest trees, including elm, black walnut, hackberry, ash, and cotton-wood; the uplands support rank prairie grasses and a variety of plants, exhibiting a strange mingling of north-western, and more southern, forms, corresponding to the peculiar mixed climate which characterises this section. Proceeding westward, a gradually increasing atmospheric aridity is evidenced by a corresponding disappearance of forest growth, which is confined to the moist margins of constant streams or water-courses, dry during the summer season, and is represented only by the persistent cotton-wood, box-elder, and willow. On the uplands, *buffalo grass* and *grama* take the place of the rank prairie sod, and are characterised by a short curly growth, and dense fibrous roots, often growing in clumps, and penetrating deeply into the dry though still nutritious soil.

Still farther west we find the depressed basins and valleys exhibiting a white saline efflorescence, due to the intense evaporation, which in the dry season concentrates the saline ingredients derived from the washed soil of the uplands on the saturated bottoms, overflowed in the season of rains. With this peculiar condition of things we meet with a class of saline plants, many of them identical with such as are found along the sea-shore, or in connection with salt marshes. Here the uplands acquire more distinctly an arid feature, to which, however, the term of desert cannot be properly applied, as, although in great measure unfit for ordinary agriculture, they still support a close growth of peculiar grasses, which in the summer rainy season assume a dull verdure, and in the succeeding dry season become converted into a nutritious hay, the saccharine and organised juices being concentrated in the dried perennial stem and leaves.

On the upper alluvial benches of the principal valleys we encounter dense

moorish growths of "wild sage" (*Artemisia*), *Sarcobatis*, and *Obione*, or grease-wood, well known to all Western explorers.

The conditions essential for timber growth, viz., superficial moisture, and shelter from fierce winds, are here confined to the deeper valleys and constant large water-courses, where cotton-wood and willow maintain a variable existence, occasionally occurring in extensive tracts along the Arkansas and the Republican Fork, while elsewhere the country presents a treeless and open waste.

The idea frequently suggested by those unacquainted with the true physical features of this section of country, of planting trees, and thus securing shelter and an increased precipitation of moisture, will by no means stand the test of a common-sense view, where the objects to be gained are precisely such as the country does not naturally admit of; and furthermore, its perfect adaptation to grazing is so manifest, that any other view of its application to useful production is not even to be desired.

Before arriving at that point of extreme aridity which a continuous open and level country would no doubt eventually reach, deserving the name of a true desert (and which is actually realised farther south in the staked plains of Texas), we encounter the abrupt elevation presented by the Rocky Mountain range, with its steep broken slopes and irregular rocky spurs. This at once changes the whole aspect of the scenery; its elevated ridges and snow-clad peaks presenting a cool condensing surface, on which the warm moist currents of air are deposited in the form of summer rains and winter snows. These necessarily give rise to perennial streams and springs, which send their watery tributes to the arid plains below, and maintain verdure in the lower valleys, which are thus adapted to cultivation by processes of irrigation.

This obvious change from increasing aridity to sufficient moisture is at once characterised by a great profusion of vegetation, including trees, shrubbery, and a variety of plants, either identical or similar to such as are met with in well-watered mountain districts to the east.

Where a sufficient elevation is attained to insure a constantly cool atmosphere, forests abound, consisting mainly of evergreen pines, spruce, and fir, but also including a scattered growth of scrubby oak, maple, birch, cotton-wood, and willow. The principal valleys that penetrate this mountain district, including the Arkansas, with its numerous branches, as the Huerfano, Purgatoire, and Greenhorn, comprise sections of great natural fertility, abundantly watered, and conveniently located for supplying adjoining mining districts with their surplus agricultural products. Hence they represent the main populous districts, which, combining all the agreeable accessories of a fine salubrious climate, and conveniences for building and fuel, will invite and retain a permanent population devoted to the mixed pursuits of agriculture and grazing.

In the accompanying list of plants, those referred to as occurring in the valley of the Huerfano and Sangre de Christo will serve to represent the natural vegetation of this peculiar mountain district.

In passing down into the valley of the Upper Rio Grande, we encounter a flora very distinct in its general features, including a number of peculiar plants and strange shrubbery, having a Mexican type. The river, here hemmed in along a great portion of its upper course by dark, igneous, and basaltic rocks, flows in deep inaccessible cañons, which open out below into wide sandy basins.

The San Luis valley, lying above this cañoned portion of the valley, presents a wide alluvial basin, including extensive tracts of fertile soil, lying along the course of the numerous tributary streams flowing down from the high mountain ridges on either side of the main valley.

This section is particularly adapted to the growth of cereals and root crops, and in its cool atmosphere abundance of grass and clear flowing water is eminently a dairy region.

In these respects, the two portions of the main valley, designated by the Mexican population as the Upper and Lower River, maintain the natural distinction in their products, the former being adapted to small grains, potatoes, butter, and cheese, the latter to maize and fruits. In this condition of things, an exchange of products would prove of mutual advantage, and afford profitable business in the way of transportation in both directions.

The natural supply of fuel for all this region is furnished in the extensive forests of *piñon* and *cedar*, which occupy adjoining rocky and barren ridges, while the higher mountain ranges will supply lumber and building material to any desired extent.

The lower portion of the valley of the Rio Grande includes the district generally referred to as New Mexico. Here we find the valley spread out into wide alluvial or sandy bottoms, bounded by bluffs of gravel and occasional rocky declivities, capped with basalt. The flora here includes the plants referred to in the accompanying list as New Mexican. Owing to the more porous nature of the soil, and the greater summer heat, the general aspect of vegetation is characterised as arid. There is a scarcity of tree growth, confined to the cotton-wood and willow, which occupy the moist bottoms or direct margins of the river. The grass of the valley is coarse, and frequently saline, and on the adjoining uplands it is scant, though of a nutritious quality. The low bottom-lands susceptible of irrigation are well adapted to the growth of maize, vines, and peaches, being subject to irregular overflows, which, when moderate in extent, and occurring at the proper season, help to maintain the natural fertility of the soil, but are occasionally very destructive in flooding growing crops, or undermining and transporting large tracts of fertile soil, leaving in its place the coarse sandy layers of the changeable river-bed. At other points of the valley the prevalent westerly winds gather up the light drifting sands of the adjoining bluffs, and deposit them in changeable ripple-marked dunes on the fertile bottoms, thus consigning them to a hopeless sterility, as well as obstructing the ordinary roads by their deep sandy beds. Still farther south, in the neighbourhood of Socorro, sub-tropical shrubs, including *Acacia*, *Mezquit*, and *Larrea*, make their appearance, marking the northern limits of the Mexican flora.

On the uplands west of the Rio Grande, near the 35° parallel, west longitude, we meet with a great variety of surface exposures. These are exhibited in extensive *mesas*, or table-lands, composed of light-coloured, porous, sedimentary rocks, bounding, with abrupt mural faces, valleys of erosion; these strata are interrupted at various points by igneous protrusions and overflows of basalt and lava, serving to diversify in a remarkable manner the external features of scenery, and to modify the texture and composition of the overlying soil. This is especially noticeable in the character of the native vegetation, which is directly adapted to these variable conditions. Thus, on the dry uplands and mesas, we find a scattered growth of *grama*, interrupted with occasional growths of *cedar* and *piñon*. On the more elevated mountain ridges we meet with dense

forests of Rocky Mountain pines, spruce, and fir, intermingled in favourable localities with oak and aspen. The lower valleys adapted to agriculture support a growth of coarse grass and shrubbery, interrupted by occasional bare saline flats. In certain sections of this district deep *cañoned* valleys conceal from view clear running streams, in which the vegetation is rank and luxuriant, while at other points the valleys expand into wide grassy basins, where, during the dry season, running water disappears from the surface, or is exhibited only in brackish springs. This character of country comprises the favourite home of the roving Navajo and Apache, and in certain defensive positions, has been occupied since the earliest historic periods by the industrious and contented Pueblo Indians. It extends, with slight variations, through Western New Mexico and Northern Arizona, the surveyed railroad route on the 35° parallel traversing the most desirable portions. Being passed over by the surveying parties during the fall and winter months, only an imperfect view of its botanical features could be obtained, but the faded vestiges of floral beauty were manifest on every hand to testify to the luxuriant richness of its summer dress.

The uplands of the valley of the Colorado, and the desert beyond, extending to the foot of the Sierra Nevada, comprise a singular and very interesting flora, the general features of which, though not thoroughly examined, are still fairly represented in scientific collections. Here arborescent *Cacti* and *tree yuccas* form a conspicuous feature in the landscape, whilst the true desert flora, such as the neat evergreen *Larrea* with its myrtle-shaped leaves, together with a host of thorny *Mimosæ*, dull-coloured *Obione*, or grease-wood, and prevalent *Artemisias*, all serve to give a faded aspect to the vegetation.

The annual growth is here exceedingly rapid and evanescent, and consists mainly of delicate grasses and tender-foliaged plants, which expand quickly with the early spring rains, and disappear as suddenly when the scorching sun licks up the superficial moisture, leaving no trace of their previous existence, save the diminutive seeds buried from sight in the light drifting sand or gravelly soil. In the dry water-courses of this district we meet constantly the *Cercidium floridum*, or "green-barked Acacia," the arborescent Dalea (*Dalea spinosa*), with its silvery leafless branches, and the valuable "iron-wood" (*Olneya Tesota*).

The *Chilopsis linearis*, allied to *Catalpa*, is also abundant, being known under the common name of the "desert willow," its long slender branches being used by the Indians for basket-work. In the river bottoms we meet with luxuriant growths of *mezquit* and "screw-bean," the former furnishing a very durable wood, affording excellent fuel, occasionally of sufficient size for railroad ties; the *screw-bean* is the principal reliance for feeding mules and cattle, as a substitute for grain.

Most of the plants of this district, including especially the *Artemisias* and other shrubby *Compositæ*, are smeared with a resinous varnish, which gives out a pleasant stimulating aroma, noticed by nearly all desert travellers. It is quite probable that some of these plants possess valuable medicinal qualities, or are adapted for dyes or varnishes, presenting a subject well worthy of investigation.

In reaching the Pacific slope of the Californian mountains, the rich vegetation of this district is brought forcibly to view in contrast with the desert forms before noticed. In the moist humid soil of the mountain valleys we here meet with those gigantic monsters of the forest found nowhere else.

Broad-spreading oaks, both evergreen and deciduous, nourish in their leafy shade delicate plants and vigorous shrubbery, while the open valleys and hilly slopes present a patchwork of flowers rivalling the colours of the rainbow. This rich botanical field, which has already given many choice plants to enrich Eastern gardens, is not yet exhausted, and new discoveries are being made every year by the zealous botanists connected with the California State Geological Survey. A regular flora of this region is now in course of preparation by Professor W. H. Brewer, under the able assistance of Professor Gray, of Cambridge, Massachusetts.

THE FOREST TREES ON THE ROUTE OF THE SURVEY.

The importance of the tree product near the line of the surveyed railroad route, both as regards supplies of fuel and purposes of construction and repairs, is of sufficient interest to receive some special notice in a general botanical report.

After leaving the wooded district of Eastern Kansas, which occupies the principal valleys with belts of timber of variable extent, and which diminishes rapidly to the west, we at length, near the 100° west longitude, enter upon a treeless district, extending for over 5°, and reaching to the foot of the Rocky Mountains. Here, with an increase of elevation and condensation of moisture, we encounter the pine forests of Eastern Colorado. A very remarkable outlier of this pine growth occupies an elevated district south-east of Denver, which, not properly pertaining to the Rocky Mountain range, in the absence of granite or metamorphic rocks, is comparatively smooth in its general outline, and easily accessible. The forest growth is here almost exclusively confined to the Rocky Mountain yellow pine (*Pinus ponderosa*), which, from its durable quality, regularity of growth, and facility for working up into the different qualities of lumber, is probably the most valuable of any Western pine. When growing singly, this pine is apt to assume a branching shape, with an irregular oval outline, but in extensive forests it presents a more uniform trunk, less knotty, and better suited for boards and dimension lumber. The interior wood, being to a considerable extent impregnated with resin, is thus rendered durable, and well adapted for railroad ties. This is the prevalent pine tree which is met with on all the elevated mountain slopes extending from the Eastern Rocky Mountains to the Sierra Nevada.

Farther to the south of the Denver pine-region, along the different lines of the surveyed railroad route through Southern Colorado and New Mexico, a very different and peculiar pine makes its appearance along the foot-hills of the Rocky Mountains, clothing the low rocky ledges with patches of dark green, as seen in a distant view.

This is the nut-pine, or *Piñon* of the natives, *Pinus edulis* of botanists. It is generally of a low branching habit, its short stocky trunk dividing near the surface of the ground into branching arms, giving it a globular outline. When growing in large bodies, its straggling branches intertwine to form almost inextricable thickets.

It is generally associated at lower elevations with a cedar (*Juniperus occidentalis*) of a similarly straggling habit, which farther west gives place to the Arizona juniper (*Juniperus pachyphlœa*, Torr.)

These trees are all well adapted for fuel, burning when dry with a clear intense flame, which is prolonged and steady, especially suited for steam

purposes. In some sections the *piñon* presents a more upright growth, and has short uniform trunks, suitable for railroad ties. The wood is durable, but knotty, and with a twisted fibre, so that it is unfit for other purposes of railroad construction.

The distribution of the piñon and cedar forests is particularly favourable for convenient supplies of railroad fuel, being scattered along the line of the route, easily accessible, and in inexhaustible amount, the range extending through New Mexico, Northern Arizona, and to the eastern base of the Sierra Nevada in California.

On the higher crests of the Rocky Mountains, the Sierra Madre, San Francisco, and the Sierra Nevada we meet with other varieties of pine and spruce, occasionally forming extensive forests, and affording material for the various uses to which different tree products are adapted. Of these we may specify the *Piño real* (*Pinus contorta*), which is noted for its slim, regular growth, particularly suited for telegraph poles and cross ties; the Douglas spruce, or mountain hemlock, affording a very durable and tough wood; Menzies' spruce, and *Abies Engelmanni*, the latter furnishing a light, soft wood, well adapted to inside work. Besides these, on the high alpine ridges, we meet with *Pinus flexilis* and *Pinus aristata*, which extend to the extreme limits of tree growth on the Rocky Mountains and the Sierra Nevada.

It will be noticed that scarcely any mention has been made of hard wood, as oak, ash, or walnut, in the central mountain region. While we have representatives of each of these, they are so comparatively rare, or of such insignificant growth, as not properly to enter into the account in any economical view of our central mountain forests. In certain sections of the Rocky Mountains, and the lower valleys of the San Francisco Mountains, we meet with a deciduous-leaved white oak, sometimes of fair size, and suitable for railroad timber, but generally of scrubby growth, and not fit for any useful purposes of construction. The same is true of the occasional scattered growths of walnut and ash, which are rarely of sufficient size or quantity to attract attention.

But on reaching the Sierra Nevada range in California, we meet not only with a great variety of peculiar pines and firs, but also large oaks, forming extensive forests, and well adapted to all the required uses of hard wood in Eastern countries. Of those deserving special notice is the white oak (*Quercus lobata*) found along the eastern tributaries of the Tulare valley, a perfect giant of vegetable growth, which covers extensive tracts of country. Besides this, there are several varieties of live-oak, occupying the interior and coast ranges, which, though not generally durable, and of a stocky growth, are no doubt applicable to a variety of useful purposes.

Then we have the red-wood forests of the coast range, the timber of which is highly prized for its durability and facility for working.

The peculiar qualities and distribution of the Californian forests would require a long special report to do justice to the subject, and will no doubt eventually receive attention when the railroad interests of that section demand more thorough investigation. For other items of information in regard to the botany of the region connected with the railroad survey, reference may be had to the following list of plants.

LIST OF PLANTS COLLECTED OR OBSERVED ON THE SURVEY OF THE KANSAS PACIFIC RAILWAY, IN 1867 AND 1868.

(*The numbers refer to the author's collection in the Botanical Department of the British Museum.*)

	RANUNCULACEÆ.		
	Clematis Douglasii	Hook	Valley of the Huerfano
	Aquilegia cærulea	Torr.	"
	Delphinium scopulorum	Gray	Sangre de Christo Pass
141	D. azureum	Michx.	Raton Mountains
	PAPAVERACEÆ.		
143	Argemone hispida	Gray	Kansas
144	A. Mexicana	Linn.	New Mexico
	CRUCIFEREÆ.		
145	Pachypodium integrifolium	Nutt.	Valley of the Huerfano
152	Erysimum Arkansanum	Nutt.	Colorado
153	E. pumilum	Nutt.	Sangre de Christo Pass
153	E. asperum	De C.	Colorado and New Mexico
146	Stanleya pinnatifida	Nutt.	Upper Arkansas River
	Draba streptocarpa	Gray	Sangre de Christo Pass
	Lepidium alyssoides	Gray	Fort Garland
	L. flavum	Gray	Colorado Desert, Feb., 1868
148	Streptanthus linearifolius	Gray	New Mexico
150	Sisymbrium incisum	Engel.	"
	CAPPARIDACEÆ.		
147	Cleome integrifolia	Torr. and Gray	Colorado and New Mexico
94	Polanisia uniglandulosa	De C.	Raton Mountains
149	P. graveolens	Raf.	"
	VIOLACEÆ.		
	Ionidium lineare	Torr.	Kansas
	IRIDACEÆ.		
34	Sisyrinchium Bermudiana	Linn.	Purgatoire Valley
	HYPERICACEÆ.		
	Hypericum Scouleri	Hook.	Sangre de Christo Pass
	Canotea holocantha	Torr.	Arizona
	CARYOPHYLLACEÆ.		
	Silene acaulis	Linn.	Sierra Blanca
	Paronychia pulvinata	Gray	"
	P. sessiliflora	Nutt.	Northern New Mexico
	Sagina Linnæ	Presl.	"
	Arenaria stricta	Michx.	Kansas " "
151	A. Fendleri	Gray	Sangre de Christo Pass
	A. arctica	Steven.	Sierra Blanca

		MALVACEÆ.	
179	Callirhoe involucrata	Nutt.	Kansas
181	C. macrorhiza	Gray	"
	Sidalcea candida	Gray	Valley of the Huerfano
	S. malvæflora	Gray	" "
	Sphæralcea incana	Torr.	Upper Arkansas
	S. Emoryi	Gray	Colorado Desert
	Malvastrum exile	Gray	"
182	M. coccineum	Gray	Purgatoire Valley
		LINACEÆ.	
95	Linum rigidum	Pursh.	Smoky Hill, Kansas
184	L. perenne	Linn.	"
		RUTACEÆ.	
	Thamnosma montanum	Gray	Colorado Desert
		COMMELYNACEÆ.	
35	Commelyna Virginica	Gray	Raton Mountains
36	Tradescantia Virginica	Linn.	"
		ZYGOPHYLLACEÆ.	
	Larrea Mexicana	Moric.	New Mexico and Arizona
		RHAMNACEÆ.	
	Ceanothus Fendleri	Gray	Northern New Mexico
		ACERACEÆ.	
	Acer glabrum	Torr.	Sangre de Christo Pass
189	Negundo aceroides	Moench.	Kansas
		POLYGALACEÆ.	
86	Polygala alba	Nutt.	Kansas
		LEGUMINOSÆ.	
88	Lupinus pusillus	Pursh.	Smoky Hill, Kansas
87	L. decumbens	Torr.	New Mexico
	Trifolium involucratum	Willd.	Sangre de Christo Pass
	T. nanum	Torr.	Sierra Blanca
	Psoralea esculenta	Pursh.	Smoky Hill, Kansas
92	P. argyrophylla	Pursh.	"
93	P. campestris	Nutt.	Purgatoire Valley
96	P. cuspidata	Pursh.	Smoky Hill, Kansas
91	P. floribunda	Nutt.	Purgatoire Valley
89	P. lanceolata	Pursh.	Smoky Hill, Kansas
90	P. digitata	Nutt.	Purgatoire Valley
	P. floribunda	Nutt.	Smoky Hill, Kansas
121	Desmanthus virgatus?	Says Gray	Raton Mountains
100	Dalea nana	Torr.	Upper Arkansas
99	D. luxiflora	Pursh.	New Mexico
	D. mollis	Torr. and Gray	Colorado River
	D. spinosa	Gray	"
	D. Emoryi	Gray	"
	D. Parryi	Torr. and Gray	"
97	Amorpha fruticosa	Linn.	New Mexico
98	A. canescens	Nutt.	"
	Parryella filifolia	Torr. and Gray	Rio Grande and New Mexico

LEGUMINOSÆ (*continued*).

	Robinia Neo-Mexicana	Gray	Valley of the Huerfano
	Algarobia glandulosa	Torr. and Gray	New Mexico
116	Sophora sericea ?	Nutt.	"
	Strombocarpa pubescens	Gray	New Mexico and Rio Colorado
119	Cassia Rœmeriana	Scheele	Raton Mountains
	Schrankia uncinata	Willd.	Smoky Hill, Kansas
104	Glycyrrhiza lepidota	Nutt.	Kansas and New Mexico
	Astragalus carycocarpus	Pursh.	Smoky Hill, Kansas
105	A. pectinacea	Gray	New Mexico
107	A. Missouriensis	Nutt.	Smoky Hill, Kansas
106	A. cyaneus	Gray	New Mexico
	A. Plattensis	Nutt.	Smoky Hill, Kansas
113	A. lotiflorus	Hook.	"
112	A. mollissimus	Torr.	"
138	A. microlobus	Gray	"
110	A. gracilis	Nutt.	"
	A. adsurgens	Pall.	Sangre de Christo Pass
	A. diphysus	Gray	Northern New Mexico
	A. lonchocarpus	Gray	Valley of the Huerfano
111	A. racemosus	Pursh.	Kansas
	A. hypoglottis	Linn.	Valley of the Huerfano
	A. flexuosus	Dougl.	" "
	A. pectinatus	Dougl.	Kansas
	A. Nuttalianus	Gray	New Mexico
	A. glabriusculus	Gray	Sangre de Christo Pass
	A. Fendleri	Gray	New Mexico
	A. decumbens	Gray	"
	Oxytropus Uralensis	Linn.	Sangre de Christo Pass
	O. splendens	Dougl.	" "
	O. deflexa	De C.	" "
114	O. Lamberti	Pursh.	Kansas
	Hedysarum Mackenzii	Richards	Valley of the Huerfano
	H. canescens	Nutt.	" "
115	Baptisia australis	R. Br.	Kansas
118	Hoffmanseggia Jamesii	Torr. and Gray	Upper Arkansas
	H. drepanocarpa	Gray	New Mexico
117	H. Drummondii	Gray	"
	Cercidium floridum	Benth.	Arizona
	Olneya Tesota	Gray	Southern Arizona
101	Petalostemon candidum	Michx.	New Mexico
102	P. violaceum	Michx.	"
103	P. macrostachyon	Torr.	"

ROSACEÆ.

	Prunus pumila	Linn.	Kansas
	Sorbus Americanus	Willd.	Greenhorn Mountain
	Cercocarpus parvifolius	Nutt.	New Mexico
120	Fallugia paradoxa	Torr.	"
	Dyas octopetala	Linn.	Sierra Blanca
	Cowania Mexicana	Dougl.	Arizona
125	Rubus ——— ?		New Mexico
	R. deliciosus	Torr.	"
	R. strigosus	Michx.	Sangre de Christo Pass
	Fragaria Virginiana	Eurhart	" "
	F. vesca	Linn.	" "
123	Potentilla Pennsylvanica	Linn.	New Mexico
122	P. rivularia ?	Nutt. (Gray says not)	"
	P. diversifolia	Lehm.	Sangre de Christo
124	P. hispidula ?	Torr. and Gray	New Mexico

		SAXIFRAGACEÆ.	
	Ribes hirtellum	Michx.	Valley of the Huerfano
	Parnassia parviflora	De C.	Upper Huerfano
	Saxifraga punctata	Linn.	Sangre de Christo
	S. cæspitosa	Linn.	,,
	S. bronchialis	Linn.	,,
		CRASSULACEÆ.	
	Sedum Rhodiola	De C.	Sangre de Christo
		ONAGRACEÆ.	
130	Epilobium paniculatum	Nutt.	New Mexico
126	E. coloratum	Muhl.	,,
131	Stenosyphon virgatus	Spach.	Kansas
128	Gaura coccinea	Nutt.	,,
129	G. parviflora	Dougl.	New Mexico
139	Œnothera lavendulæfolia	Torr. and Gray	Kansas
211	Œ. triloba	Nutt.	New Mexico
136	Œ. pinnatifida	Nutt.	Kansas
	Œ. Missouriensis	Sims	,,
140	Œ. serrulata	Nutt.	Purgatoire Valley
134	Œ. coronopifolia	Torr. and Gray	Upper Arkansas
132	Œ. canescens	Torr.	Purgatoire Valley
133	Œ. biennis	Linn.	,,
137	Œ. albicaulis	Nutt.	,,
138	Œ. speciosa	Nutt.	,,
		LOASACEÆ.	
	Mentzelia multiflora	Nutt.	Valley of the Huerfano
	M. (Eucnide) urens	Parry	Colorado Valley
191	M. ornata	Torr.	New Mexico
192	M. Wrightii	Gray	,,
193	M. nuda	Torr. and Gray	,,
		CACTACEÆ.	
	Opuntia arborescens	Engel.	New Mexico
	O. Bigelovii	Engel.	Colorado Desert
	O. Davisii	Engel. and Big.	Western New Mexico
	O. Emoryi	Engel.	,, ,,
	O. tessellata	Engel.	Colorado Desert
	O. frutescens	Engel.	New Mexico
	Echinocactus Simpsonii	Engel.	Sangre de Christo
	E. Wislizeni	Engel.	New Mexico
	Cereus, giganteus	Engel.	Southern Arizona
	C. Engelmanni	Parry	Arizona
	C. phœniceus	Engel.	Valley of the Huerfano
		CUCURBITACEÆ.	
	Cucurbita perennis	Gray	Kansas
	C. digitata	Gray	Arizona
127	Cyclanthera dissecta	Arnott	New Mexico
		UMBELLIFERÆ.	
	Cynomarathrum saxatile	Nutt. in herb. Durand.	Sangre de Christo
	Heracleum lanatum	Michx.	Valley of the Huerfano
	Cymopterus alpinus	Gray	Sangre de Christo

COMPOSITÆ.

	Liatris scariosa	Willd.	Upper Huerfano
195	L. punctata	Hook.	New Mexico
	Kuhnia eupatoria	Linn.	,,
177	Pyrrhopappus grandiflorus	Nutt.	
	Erigeron grandiflorum	Hook.	Sangre de Christo
199	E. speciosum	De C.	New Mexico
	E. compositum	Pursh.	Sangre de Christo
200	E. bellidiastrum	Nutt.	New Mexico
	E. cæspitosum	Nutt.	,,
196	Brickellia reniformis	Gray	Purgatoire Valley
198	B. grandiflora	Nutt.	New Mexico
	Baccharis Wrightii	Gray	Valley of the Huerfano
	Machæranthera canescens	Gray	,, ,,
197	M. tanacetifolia	Nees.	Kansas
204	Diplopappus ericoides	Less.	,,
	Townsendia strigosa	Nutt.	Valley of the Huerfano
202	T. grandiflora	Nutt.	,, ,,
	Gutierrezia Euthamiæ	Torr. and Gray	,, ,,
	Solidago rigida	Linn.	Kansas
201	S. Missouriensis	Nutt.	,,
	Aplopappus spinulosus	De C.	,,
203	A. Fremontii	Gray	Valley of the Huerfano
	A. Nuttallii	Gray	,, ,,
	A. Parryi	Gray	Sangre de Christo
205	A. rubiginosus	Torr. and Gray	Purgatoire Valley
	Linosyris graveolens	Torr. and Gray	New Mexico
	L. Bigelovii	Gray	Valley of the Huerfano
	L. Howardii	Gray	,, ,,
	L. depressa	Gray	,, ,,
	Tetradymia inermis	Nutt.	,, ,,
	T. spinosa	Nutt.	Colorado Desert
	Tessaria borealis	Gray	Rio Grande and Rio Colorado
	Aster spinosus	Benth.	New Mexico
	A. tortifolius	Gray	Arizona
194	Pectis angustifolia	Gray	Valley of the Huerfano
	P. filipes	Gray	Prescott, Arizona
	Carphephorus junceus	Gray	Rio Colorado
166	Gaillardia pinnatifida	Torr.	New Mexico
168	G. pulchella	Foug.	,,
	Porophyllum scoparium	Gray	Arizona
	Psathyrotes ramosa	Gray	Colorado Desert
	Perityle nuda	Gray	Rio Colorado
	Palafoxia linearis	Lag.	,,
	Monolopia minor	De C.	Sierra Nevada
	Leptosyne Newberryi	Gray	,,
	Diaperia prolifera	Nutt.	New Mexico
210	Engelmannia pinnatifida	Torr. and Gray	Kansas
207	Melampodium cinereum	De C.	Valley of the Huerfano
157	Rudbeckia laciniata	Linn.	New Mexico
	Lepachys tagetis	Gray	Upper Arkansas
158	L. columnaris	Torr. and Gray	New Mexico
	Helianthus petiolaris	Gray	Valley of the Huerfano
159	H. lenticularis	Dougl.	Raton Mountains
165	Heliomeris multiflora	Torr. and Gray	Sangre de Christo
	Helianthella uniflora	Torr. and Gray	,,
	H. Parryi	Gray	,,
156	Heliopsis lævis	Pers.	Raton Mountains
	Encelia nivea	Torr. and Gray	Southern Arizona
155	Zinnia grandiflora	Nutt.	Purgatoire Valley
161	Thelesperma gracile	Gray	Kansas
160	T. filifolium	Gray	Raton Mountains

COMPOSITÆ (*continued*).

	Bidens tenuisecta	Gray	New Mexico
	B. cernua	Linn.	Fort Garland
162	Ximenesia encelioides	Cav.	Valley of the Huerfano
	Sanvitalia Aberti	Gray	New Mexico
	Bahia biternata	Gray	"
170	B. oppositifolia		
	Villanova chrysanthemoides	Gray	Valley of the Huerfano
	Lowellia aurea	Gray	Upper Arkansas
	Schkuhria Neo-Mexicana	Gray	Valley of the Huerfano
163	Dysodia chrysanthemoides	Lay.	New Mexico
169	Hymenopappus scabeosæus	Herit.	Kansas
171	Hymenopapus ——— ?		New Mexico
167	H. corymbosus	Torr. and Gray	"
	Helenium Hooperii	Gray	Sangre de Christo
	Actinella scaposa	Gray	Valley of the Huerfano
	A. acaulis	Nutt.	Sangre de Christo
	A. Richardsonii	Nutt.	Valley of the Huerfano
164	Riddellia tagetina	Nutt.	New Mexico
	Senecio exaltatus	Nutt.	Sangre de Christo Pass
175	S. longilobus	Benth.	New Mexico
	S. Bigelovii, var. Hallii	Gray	Sangre de Christo Pass
208	Grindelia squarrosa	Duval	Kansas
	Hymenoclea monogyra	Torr. and Gray	New Mexico
	Dicoria canescens	Gray	Colorado Desert
209	Berlandiera incisa	Torr. and Gray	New Mexico
	Franseria deltoidea	Torr.	Southern Arizona
154	F. Hookeriana	Nutt.	
	Artemisia tridentata	Nutt.	New Mexico
173	A. filifolia	Torr.	"
	A. frigida	Willd.	Sangre de Christo
174	A. Canadensis	Michx.	Arizona
	A. Parryi	Gray, nov. sp.	Sangre de Christo
	Grapholium strictum	Gray	Fort Garland
	Antennaria	R. Br.	Sangre de Christo
	A. dioica	Gœrtn.	"
178	Muhlgedium pulchrum	Nutt.	Valley of the Huerfano
176	Lygodesmia juncea	Dougl.	Kansas
172	Achillea millefolium	Linn.	New Mexico
206	Chrysopsis villosa	Nutt.	"

CAMPANULACEÆ.

	Campanula uniflora	Linn.	Sangre de Christo
85	C. rotundifolia	Linn.	New Mexico

ERICACEÆ.

	Vaccinium myrtilloides	Hook.	Sangre de Christo
	Arctostaphylos uva-ursi	Spreng.	Rocky Mountains
	Pyrola secunda	Linn.	"
	Chimaphila umbellata	Nutt.	"

APOCYNACEÆ.

3	Apocynum cannabinum		Kansas

PLANTAGINACEÆ.

84	Plantago Patagonica	Jacq.	Kansas

PRIMULACEÆ.

	Primula angustifolia	Torr.	Sierra Blanca
83	Lysimachia ciliata	Linn.	Raton Mountains
	Androsace chamæjasme	De C.	Sierra Blanca
	A. occidentalis	Pursh.	Kansas
	A. septentrionalis	Linn.	New Mexico

		URTICACEÆ.	
26	Humulus lupulus	Linn.	Purgatoire Valley and N. M.
		BIGNONIACEÆ.	
	Chilopsis linearis	De C.	New Mexico and Arizona
82	Martynia proboscidea	Glox.	,, ,,
		OROBANCHACEÆ.	
	Phelipæa Ludoviciana	Dougl.	Valley of the Huerfano
	P. erianthera	Engel. nov. sp.	Rio Grande, New Mexico
		SCROPHULARIACEÆ.	
81	Pentstemon Torreyi	Benth.	Raton Mountains
78	P. albidum	Nutt.	Kansas
77	P. acuminatum		New Mexico
75	P. grandiflorum	Fras.	Kansas
79	P. glaucum	Nutt. ?	New Mexico
80	P. cobeæ	Nutt.	Kansas
74	Gratiola Missouriensis	Engel.	Valley of Purgatoire
	Pambignum	Torr.	New Mexico
	Maurandia Wislizeni	Engel.	,,
71	Orthocarpus luteus	Nutt.	,,
	O. purpureus	Gray	,,
	Castilleia purpurea	Dougl.	,,
76	C. sessiliflora	Pursh.	,,
72	C. integra	Gray	,,
	Rhinanthus angustifolius	Gmel.	Sangre de Christo
	Cordylanthus Wrightii	Gray	New Mexico
		ACANTHACEÆ.	
	Sericographus Californicus	Gray	Arizona
		VERBENACEÆ.	
69	Verbena Aubletia	Linn.	Kansas
70	V. stricta	Vent.	Raton Mountains
73	Lippia reptans	Knuth.	New Mexico
		LABIATEÆ.	
63	Teucrium lanciniatum	Gray	Raton Mountains
	T. Cubense	Linn.	Valley of the Huerfano
62	T. Canadense	Linn.	Raton Mountains
	Stachys palustris	Linn.	Valley of the Huerfano
68	Hedeoma Drummondii	Benth.	Raton Mountains
	Hyptis Emoryi	Torr.	Arizona
	Scutellaria resinosa	Torr.	Kansas
64	S. Drummondii	Benth.	Raton Mountains
67	Salvia trichostemoides		New Mexico
65	Monarda aristata	Nutt.	Raton Mountains
66	M. fistulosa	Linn.	Raton Mountains
	M. Sibirica	Dougl.	Greenhorn Mountain
	Mertensia alpina	Dougl.	Sierra Blanca
61	Cedronella pallida	Lindl.	Raton Mountains
		BORAGINACEÆ.	
59	Eritrichium glomeratum	De C.	Raton Mountains
	E. crassisepalum	Torr.	Fort Garland
60	Lithospermum pilosum	Nutt.	New Mexico
		HYDROPHYLLACEÆ.	
	Nama hispida	Gray	New Mexico
58	Phacelia circinata	Jacq.	Raton Mountains

POLEMONIACEÆ.

	Fouquiera splendens	Engel.	Arizona
58	Gilia longiflora	Dougl.	New Mexico
56	G. tenuiflora		Raton Mountains
	G. pinnatifida	Nutt.	Sangre de Christo
57	G. pulchella		Raton Mountains

CONVOLVULACEÆ.

54	Ipomœa Smithii (Unique)	Bell	Purgatoire Valley
	I. leptophylla	Torr.	Kansas
55	I. fandurata	Meij.	,,
51	Cuscuta Gronovii	Willd.	Purgatoire Valley
52	Evolvulus argenteus	Pursh.	,,
53	Convolvulus Hermannii		

SOLANACEÆ.

47	Solanum Jamesii	For.	Raton Mountains
48	S. elæagnifolium	Pursh.	,,
50	S. nigrum	Linn.	Purgatoire Valley
49	S. rostratum	Dunal.	Upper Arkansas
45	Physalis lobata	Torr.	,,
46	P. longifolia	Nutt.	Kansas
	P. mollis	Nutt.	Valley of the Huerfano
	P. cardiophylla		Valley of the Pecos, New Mexico
6	Datura meteloides	Torr.	Rio Colorado
2	Withania sordida	Dan.	Purgatoire Valley

GENTIANACEÆ.

	Gentiana acuta	Michx.	Sangre de Christo
	G. Parryi	Engel.	,,
	Frasera speciosa	Dougl.	,,

ASCLEPIADACEÆ.

	Asclepias speciosa	Torr.	Upper Arkansas
	A. Jamesii	Torr.	Valley of the Huerfano
7	A. macrotis		,, Purgatoire
8	Acerates auriculata	Engel.	,, ,,
10	A. asperula	De C.	,, ,,
9	A. decumbens	Decaisne	Kansas
	A. viridiflora	Ell.	,,
	A. paniculata	De C.	,,
4	A. verticillata	Linn.	Raton Mountains
5	A. linearis	Durand	Purgatoire Valley

NYCTAGINACEÆ.

	Mirabilis multiflora	Gray	Valley of the Huerfano
11	M. triflora	Benth.	Raton Mountains
15	Abronia fragrans	Nutt.	Upper Arkansas
14	A. cycloptera	Gray	Purgatoire Valley
1	Oxybaphus coccineus	Torr.	Purgatoire River
12	O. nyctagineus	Sweet.	,,
13	O. angustifolius	,,	,,

CHENOPODIACEÆ.

	Teloxys cornuta	Torr.	New Mexico
	Sarcobatis vermicularis	Torr.	Upper Arkansas
	Obione canescens	Moq.	,,
16	O. occidentalis	Moq.	Purgatoire Valley
	Eurotia lanata	Moq.	Upper Arkansas

		AMARANTHACEÆ.	
	Acanthochyton Wrightii	Gray	Rio Grande
19	Frœlichia Floridana	Moq.	Raton Mountains
		POLYGONACEÆ.	
17	Polygonum amphibium	Linn.	Raton Mountains
20	Eriogonum Jamesii	Benth.	New Mexico
	E. racemosum	Nutt. (?)	"
22	E. tenellum	Torr.	Valley of the Huerfano
21	E. lachnogynum	Torr.	New Mexico
	E. cernuum	Nutt.	Valley of the Huerfano
	E. effusum	Nutt.	"
	Acanthogonum rigidum	Torr.	Colorado Desert
18	Rumex venosus	Pursh.	New Mexico
		SANTALACEÆ.	
	Comandra pallida	De C.	Kansas
		EUPHORBIACEÆ.	
25	Euphorbia dentata	Michx.	Upper Arkansas
24	E. marginata		Purgatoire Valley
23	E. lata		"
	Aphora humilis	Engel.	Kansas
		JUGLANDACEÆ.	
	Juglans rupestris	Engel.	Arizona
		ANACARDIACEÆ.	
187	Rhus toxicodendron	Linn.	New Mexico
		CUPULIFERÆ.	
	Quercus lobata	Nees.	Western New Mexico
	Q. Emoryi	Torr.	Arizona
	Q. agrifolia	Nees.	California
		SPARSIFLORÆ.	
29	Croton muricatum	Nutt.	Raton Mountains
		BETULACEÆ.	
	Betula alba	Spach.	Sangre de Christo
		ZYGOPHYLLACEÆ.	
186	Kallstrœmia maxima	Torr.	New Mexico
		SALICACEÆ.	
27	Salix longifolia	Muhl.	Upper Arkansas
	Populus tremuloides	Michx.	Sangre de Christo
	P. angustifolia	Torr.	Valley of the Huerfano
	P. monilifera	Ait.	Western valleys
		GERANIACEÆ.	
185	Geranium Fremontii	Pursh.	New Mexico
		CONIFERÆ.	
	Ephedra antisyphilitica	Berland.	New Mexico to Arizona
	Pinus ponderosa	Dougl.	Rocky Mountains to the Pacific
	P. contorta	Dougl.	Sangre de Christo
	P. aristata	Engel.	"
	P. edulis	Engel.	New Mexico
	P. flexilis	James	Sangre de Christo
	P. Coulteri	Dougl.	Sierra Nevada

CONIFERÆ (*continued*).

	Abies Engelmanni	Parry.	Sangre de Christo
	A. Menziesii	Dougl.	,,
	A. Douglasii	Hook.	,,
	A. grandis	Dougl.	,,
	Juniperus occidentalis	Hook.	Arizona and New Mexico
	J. pachyphlæa	Torr.	Arizona
28	J. Virginiana	Linn.	Raton Mountains

ORCHIDACEÆ.

	Goodyera Menziesii	Lindl.	Greenhorn Mountains
	Corallorhiza multiflora	Nutt.	,, ,,

ALISMACEÆ.

30	Sagittaria variabilis	Engel.	New Mexico

AMARYLLIDACEÆ.

	Agave Americana	Linn.	Arizona

LILIACEÆ.

33	Calochortus venustus	Benth.	Valley of the Huerfano
	Lloydia serotina	Reich.	Sierra Blanca
	Yucca angustifolia	Pursh.	Kansas
	Yucca ———— (?)		Arizona and Colorado Desert
	Dasylirion graminifolium	Tucc.	Arizona
31	Allium cernuum	Roth.	Raton Mountains
32	A. striatum	Jacq.	,,

JUNCACEÆ.

	Juncus Balticus	Willd.	Sangre de Christo
	J. longistylis	Torr.	,,
	J. nodosus	Linn.	Valley of the Huerfano
	J. Mertensianus	Bong.	,, ,,
	J. tenuis	Willd.	Kansas

OXALIDACEÆ.

188	Oxalis violacea	Linn.	Kansas

CYPERACEÆ.

	Scirpus pungens	Vahl.	Smoky Hill, Kansas
	Fimbristylis spadicea	Vahl.	Valley of the Huerfano
	Cyperus inflexus	Muhl.	Upper Arkansas

GRAMINEÆ.

	Panicum virgatum	Linn.	Upper Arkansas
	P. obtusum	H. B. K.	,,
	Eriocoma cuspidata	Nutt.	Valley of the Huerfano
37	Aristida purpurea	Nutt.	Kansas
	A. Californica		New Mexico
	Agrostis scabra	Willd.	,,
	Sporabolus ramosissimus	Kth.	Upper Arkansas
	Vilfa tricholepis	Torr.	New Mexico
	Muhlenbergia gracilis	Torr.	Sangre de Christo
38	M. gracillima	Torr.	,,
	Vaseya comata	Thurb.	Musca Pass
	Pappyphorum boreale	Ledb.	New Mexico
	Pleuraphis Jamesii	Torr.	Upper Arkansas
39	Bouteloua oligostachya	Torr.	Kansas to Arizona
	B. eriopoda	Torr.	New Mexico and Arizona
	B. polystachya	Torr.	Arizona
42	B. curtipendula	Gray (Chloris)	Kansas

GRAMINEÆ (*continued*).

40	Buchloe dactyloides	Engel.	Kansas
44	Bryzopyrum strictum		New Mexico
	Munroa squarrosa	Torr.	,,
	Tricuspis acuminata	Munroe	Kansas
	T. speciosa		New Mexico
41	Lepturus paniculatus	Nutt.	Upper Arkansas
	Tristeum subspicatum	Beauv.	,,
	Danthonia sericea	Nutt.	Sangre de Christo
	D. spicata	Beauv.	,,
	Festuca ovina	Linn.	,,
	Poa Andina	Nutt.	,,
	Koeleria cristata	Pers.	,,
43	Andropogon furcatus	Muhl.	New Mexico

FILICES.

Pellæa atropurpurea	Link.	Arizona
P. longimucronata	Hook.	,,
Cheilanthes lanuginosa	Nutt.	Valley of the Huerfano
C. Fendleri	Hook.	Prescott, Arizona
Notholæna dealbata	Kunze.	Kansas
N. Fendleri	Kunze.	Valley of the Huerfano
Woodsia Oregana	Eaton.	New Mexico

APPENDIX B.

ROUTES.

TABLES OF DISTANCES AND ELEVATIONS EAST OF THE RIO GRANDE.

No. 1.—FROM THE END OF THE TRACK IN KANSAS TO THE ARKANSAS RIVER AT FORT LYON.

Elevations above Tide-water.	Distances from	Local Distances.	From Sheridan.	From Kansas City.
Feet.		Miles.	Miles.	Miles.
2,957	Sheridan, Kansas	..	..	405
3,056	To Fort Wallace	12	12	417
3,126	Pond Creek	3	15	420
..	Cheyenne Wells, Colorado	40	55	460
..	Denver Junction	10	65	470
4,192	Big Sandy	5	70	475
..	Colton's Spring	15	85	490
3,725	Fort Lyon, Colorado	35	120	525

No. 2.—RATON MOUNTAIN LINE.

Elevations above Tide-water.	Distances from	Local Distances.	From Sheridan.	From Kansas City.
Feet.		Miles.	Miles.	Miles.
3,725	Fort Lyon, Colorado	..	120	525
4,266	To Mouth of Chequaco	50	170	575
6,166	Cimarron Pass (Point of Raton Mountain)	40	210	615
..	Cimarron River	13	223	628
7,030	Capulline Summit	6	229	634
..	Vermejo	..	..	..
5,634	Red River Crossing (45 from Cap. Smt.)	45	274	679
..	Fort Union Depôt (Krœnig's)	54	328	733
6,718	Divide between Canadian and Pecos	15	343	748
6,233	Las Vegas	7	350	755
6,156	Priest's Gap	4	354	759
6,264	Chupaynas Summit	$1\frac{1}{2}$	356	761
..	Tecaloté Crossing	$9\frac{1}{2}$	365	770
5,406	Pecos River (Biyendante)	11	376	781
..	Capoté Pass	13	389	794
6,917	Cañon Blanco Summit	17	406	811
..	Lagunas	5	411	816
..	Zuñi Timber	8	419	824
..	Monte Largo	17	436	841
..	Aguaji Colorado	7	443	848
..	Tejeras	6	449	854
..	Rio Grande at Albuquerque	17	466	871
4,833	Rio Grande at Pajarida	17	466	871
4,803	Rio Grande at Isletta	18	466	871

REMARKS.—Summit of Trinchera Pass from Fort Lyon ..... $111\frac{1}{2}$ miles.
" " " Elevation ..... 6,973 feet.
Foot of Flagstaff at Fort Union, Elevation ..... 6,613 feet.
Fort Craig, from Pajarida ..... 103 miles.
" Elevation ..... 4,361 feet.

No. 3.—GALISTEO ROUTE.

Elevations above Tide-water.	Distances from	Local Distances.	From Sheridan.	From Kansas City, *via* Raton mt.	From Kansas City, *via* Cimarron.
Feet.		Miles.	Miles.	Miles.	Miles.
6,917	Cañon Blanco Summit	..	406	811	739
..	To head of South Fork of Galisteo	4	410	815	743
..	Forks of Galisteo	21	431	836	764
..	Santa Fé Depôt.....	5	436	841	769
..	Anthracite Coal Mine (Placier Mtn.)	4	440	845	773
5,042	San Felipe	23	463	868	796
	Distances by "San Miguel Cut off."				
	To Tecaloté Intersection	..	365	770	698
	Bernal.....	4	369	774	702
	Pecos Crossing (1 mile above San Miguel)	8	377	782	710
	Summit of Spanish Range (2 miles west of Pigeon's Ranche)	28	405	810	738
	Galisteo Town	15	420	825	753
	Forks of Galisteo	3	423	828	756
	San Felipe	32	455	860	788

No. 4.—CIMARRON ROUTE.

Elevations above Tide-water.	Distances from	Local Distances.	From Harker.	From Kansas City.
Feet		Miles.	Miles.	Miles.
1,466	Fort Harker	..	..	218
..	To Fort Zarah (Arkansas River)....	41	41	259
..	Fort Larned	35	76	294
..	Fort Dodge	51	127	345
..	Upper Cimarron Crossing of the Arkansas	24	151	369
..	Sand Creek	60	211	429
..	Lower Crossing of the Cimarron	14	225	443
..	East Side of Eight-Mile Ridge	12	237	455
..	Middle Cimarron Spring	18	255	473
..	Head of Twelve-Mile Valley	12	267	485
..	Crossing of the Cimarron	15	282	500
..	Upper Cimarron Spring	8	290	508
..	Cold Spring	7	297	515
..	Cedar Spring	14	311	529
..	Sim's Spring	14	325	543
..	Rabbit-Ear Creek	23	348	566
..	Whetstone Creek	13	361	579
..	Rock Creek.....	11	372	590
..	Point of Rocks	14	386	604
..	Red River	26	412	630
..	Fort Union Depôt (Krœnig's)	31	443	661
6,233	Las Vegas	22	465	683
5,406	Pecos River above Anton Chico.....	26	491	709
6,917	Cañon Blanco Summit	30	521	739
5,042	Rio Grande at San Felipe	57	578	796
4,803	,, at Isletta	60	581	799

No. 5.—HUERFANO ROUTE.

Elevations above the Sea.	Distances from	Local Distances.	From Kansas City.
Feet.		Miles.	Miles.
3,725	Fort Lyon, Colorado	120	525
3,892	To Bent's Fort	18	543
4,063	Huerfano Junction	50	593
6,287	Union Cross Roads	50	643
9,186	Sangre de Christo Summit	35	678
7,783	Fort Garland	25	703
7,301	Rio Grande at Toas Cañon	33	736
5,042	San Felipe	113	849
4,868	Albuquerque	30	879
4,833	Pajarida	6	885
4,803	Isletta	6	891

REMARKS.—Mosca Pass, Elevation ..... 9,577 feet.
" distance from Fort Lyon ..... 158 miles.

No. 6.—PUNTIA PASS ROUTE.

Elevations.	Distances from	Local Distances.	From Kansas City.
Feet.		Miles.	Miles.
3,725	Fort Lyon, Colorado	..	525
3,892	To Bent's Fort	18	543
..	Fort Reynolds	54	597
..	Pueblo	17	614
..	Cañon City	41	655
..	McCandless Park	10	665
..	Pleasant Valley	20	685
6,500	Forks of the Arkansas	20	705
..	Point of leaving ditto	10	715
8,600*	Summit of Puntia Pass	15	730
..	Sahwatch (East)	20	750
..	Conejos	40	790
..	Juan	83	873
5,042	San Felipe	30	903
4,868	Albuquerque	30	933
4,833	Pajarida	6	939
4,803	Isletta	6	945

* Barometer measurement.

TABLES OF DISTANCES AND ELEVATIONS FROM THE RIO GRANDE TO THE RIO COLORADO, *viâ* 35TH PARALLEL.

No. 1.—PRINCIPAL LINE (*viâ* NAVAJO PASS, WHIPPLE PASS, PARTRIDGE CREEK, AND YAMPA SUMMIT).

Elevations.	From Isletta, 12 miles south of Albuquerque.	Local Distances.	From Isletta.
Feet.		Miles.	Miles.
4,803	**Isletta to—**		
5,276	Puerco Summit	14	14
5,031	Mouth of El Rito	13	27
5,310	Sheep Springs	13	40
5,535	El Rito	8	48
5,633	Laguna Intersection	4	52
5,711	Laguna	4	56
5,870	Cuvero	8	64
6,185	Remances (Ricket Post)	14	78
6,375	Fort Wingate	10	88
6,557	Aguo Azul	12	100
7,177	Navajo Pass (Summit of Sierra Madre)	22	122
..	Carizo Springs	6	128
6,649	Old Fort Fauntleroy (New Fort Wingate)	10	138
6,220	Zuñi and Fort Defiance Road	18	156
5,855	Cañon of Navajo Creek	30	186
5,626	Navajo Springs	14	200
5,512	Signal Hill	5	205
4,998	Little Colorado (mouth of Navajo Creek)	35	240
4,765	Sunset Crossing	35	275
5,294	Cañon Diablo	28	303
..	Cotton-wood Cañon	11	314
6,358	Padre Cañon	10	324
7,101	San Francisco Ridge	13	337
7,196	Leroux Spring	2	339
7,510	Tonto Pass (Leroux Summit, near Mount Agassiz)	3	342
7,558	Bald Peak (unnecessary summit)	9	351
7,199	Park Spring	6	357
7,206	Whipple's Pass	5	362
5,512	Forks of Partridge Creek	32	394
5,285	Russel's Tank	6	400
5,088	Mouth of Partridge Creek Valley	20	420
4,648	Crossing of Val de Chino	11	431
5,127	Beale's Pass	17	448
5,241	Yampa Gap (entrance to Yampa Cañon)	22	470
3,783	Truxton's Spring	27	497
3,170	Peacock Spring	20	517
3,473	Wallapi Pass (Railroad Pass)	14	531
1,286	Mojave Gap	27	558
353	Colorado River (near the Needles, 25 miles below Fort Mojave)	22	580

No. 2.—LAGUNA LINE.

Elevations above Tide-water.	Distances from San Felipe, on Rio Grande, 30 miles north of Albuquerque.	Local Distances.	From San Felipe.
Feet.		Miles.	Miles.
5,042	San Felipe (Rio Grande) to—		
..	Mouth of Jemez	7	7
..	Mouth of Salt Creek	21	28
..	Rio Puerco Summit	11	39
..	Rio Puerco	14	53
..	San Antonio Summit	10	63
..	Ojo de Chamisa	7	70
5,633	Laguna Intersection	8	78

No. 3.—WHITE MESA LINE.

Elevations above Tide-water.	Distances from	Local Distances.	From Park Springs.
Feet.		Miles.	Miles.
7,199	Park Spring (357 miles from Isletta) to—		
6,102 } 6,132 }	Junction with Park Creek Line	15	15
5,579	Cedar Creek Cañon (Crossing)	10	25
5,498	Point of White Mesa	23	48
5,677	Point of Blue Mesa	11	59
5,908	Summit between Val de Chino and Cataract Creek	10	69
6,166	Yampa Gap—Summit	7	76
5,178	Crossing of Aubrey Valley	10	86
5,369	Junction with Principal Line near Yampa Gap	9	95

No. 4.—LAJA GAP LINE.*

Elevations above Tide-water.	Distances from	Local Distances.	From Park Springs.
Feet.		Miles.	Miles.
7,199	Park Spring (357 miles from Isletta) to—		
..	Laja Gap (Summit)	44	44
..	Val de Chino	9	53
6,166	Mesa Gap	8	61
5,369	Yampa Junction	19	80

* Estimated.

No. 5.—COSNINO CAVES LINE.

Elevations above Tide-water.	Distances from Isletta.	Local Distances.	From Isletta.
Feet.		Miles.	Miles.
4,765	To Sunset Crossing	..	275
4,580	Mouth of Cañon Diablo	33	308
6,090	Cosnino Caves	26	334
6,428	Junction with Padre Cañon Line	6	340

Being 13 miles longer than from Sunset Crossing to same Junction by Cañon Line.

No. 6.—AZTEC PASS LINE.

Elevations above Tide-water.	Distances from Isletta.	Local Distances.	From Isletta.
Feet.		Miles.	Miles.
7,199	To Park Spring	..	357
6,132	Junction of Park Creek with White Mesa Line	15	372
5,810	In Dry Cañon	5	377
5,731	In bed of Cedar Creek	5	382
6,033	Summit bet. Cedar and Partridge Creeks	5	387
5,521	Junction of Park Creek with Whipple Pass Line	6	393
	To same point *viâ* Whipple Pass Line	$1\frac{8}{10}$	$393\frac{8}{10}$
5,315	To Pearl Spring	6	399
5,285	Russel's Tank	1	400
5,088	Mouth of Partridge Valley	20	420
4,653	Junction with Yampa Line.....	8	428
4,649	Crossing of Val de Chino	2	430
5,139	Turkey Creek	12	442
5,609	Connection of Miller and Schuyler	6	448
6,117	Summit of Aztec Pass	9	457
5,170	Anvil Rock.....	13	470
4,980	Cañon	8	478
5,052	South of Cross Mountain.....	3	481
5,076	Divide between Cañon Creek and Fort Rock Spring	4	485
4,972	North of Fort Rock Spring	3	488
4,892	Divide between White Cliff and Cañon Creek	5	493
4,783	End of Line	2	495

No. 7.

				Miles.
From the Rio Grande	to the Rio Colorado	by	White Mesa Line	563
,,	,,	,,	by Laja Gap Line	548
,,	,,	,,	by route N. of Mount Taylor and Partridge Creek Line	558
,,	,,	,,	North of Mount Taylor and Laja Gap Line	526

TABLES OF DISTANCES AND ELEVATIONS WEST OF THE COLORADO RIVER.

No. 1.—ROUTE FROM THE NEEDLES (COLORADO RIVER) TO SAN FRANCISCO (*vid* BENITO PASS).

Elevations above Tide.	Distances from	Local Distances.	From the Colorado.
Feet.		Miles.	Miles.
1,159	To Sacramento Springs	22	22
2,579	Piute Pass (Summit)	18	40
675	Chemeuvis Pass	26	76
530*	Sink of Perry Basin	..	..
1,000	Crater Station	14	90
1,200	Volcanic Point	20	110
1,700†	Squaw Summit	10	120
2,100†	Crater Pass (Summit)	15	135
1,900†	Malpais Sink	10	145
2,375	Mojave River	25	170
2,388	Desert Lake	30	200
3,080	Eastern foot of Sierra Nevada	35	235
4,008	Tehachapa Pass	15	250
2,020	Bird Point	20	270
795	Tulare Plain	15	285
700†	Buena Vista	35	320
700†	Polvero	75	395
2,100†	Summit of Coast Range (San Benito Pass)	15	410
..	Gilroy	85	495
..	San José	30	525
..	San Francisco	50	575

* Line does not descend to level of sink.
† Estimated.

No. 2.—THE CHALAMA ROUTE.

Elevations above Tide.	Distances from	Local Distances.	From Colorado Riv.
Feet.		Miles.	Miles.
4,008	Summit of Tehachapa Pass	..	250
2,020	To Bird's Point	20	270
795	Western foot of Sierra Nevada	15	285
700*	Buena Vista	35	320
1,500 to 2,000	Chalama Pass (Summit of Coast Range)	47	367
..	Forks of Estrella	15	382
..	Mouth of Estrella	18	400
..	San Benito Branch (Head of Salinas Valley)	30	430
..	Natividad	58	488
..	Head of Pajaro Valley	12	500
Railway completed in 1868.	Gilroy	13	513
	San José	30	543
	San Francisco	50	593

* Estimated.

No. 3.—PANOCHE GRANDE ROUTE.

Elevations above Tide.	Distances from	Local Distances.	From Colorado Riv.
Feet.		Miles.	Miles.
4,008	Tehachapa Summit	..	250
2,020	To Bird Point	20	270
795	Western foot of Sierra Nevada	15	285
700*	Point of Buena Vista Lake	26	311
..	North Point of Tulare Lake	66	377
..	Posey China Creek	22	399
..	Panoche Grande Creek	23	422
2,200	Panoche Grande Pass (Summit of Coast Range)	22	444
..	Polvadero	19	463
..	Gilroy	27	490
..	San José	30	520
Tide-water.	San Francisco	50	570

* Estimated.

No. 4.—TULARE VALLEY ROUTE * (EAST SIDE).

Elevations above Tide.	Distances from	Local Distances.	From Colorado Riv.
Feet.		Miles.	Miles.
4,008	Tehachapa Summit	..	250
795	To west foot of Sierra Nevada	35	285
..	Kern River	7	292
..	Posey Creek	9	301
..	White River	24	325
..	Deer Creek	15	340
..	Tule River	5	345
..	Outside Creek	20	365
..	Deep Creek	4	369
..	Packwood Creek	3	372
..	Visalia	2	374
22	Stockton	180	554
Tide-water.	San Francisco	79	633

PACHECO PASS ROUTE AND EAST SIDE OF TULARE VALLEY.*

..	Visalia	..	374
..	To King's River	23	397
..	Fresno	38	435
..	San Luis Ranche (eastern foot of Pacheco Pass)	62	497
..	Summit of Pacheco Pass	5	502
..	Hollenback's (western foot of Pacheco Pass)	8	510
..	Gilroy	20	530
..	San Francisco	80	610

* The line would be shorter, more cheaply constructed, and less liable to interruption from floods on *west* side of Tulare Valley, but would not develop local resources as well —the west side being dry and unattractive to settlement.

No. 5.—SAN DIEGO BRANCH.

Elevations above Tide.	Distances from	Local Distances.	From Colorado Riv.
Feet.		Miles.	Miles.
675	Chemehuevis Pass, Cal. (Junction of San Francisco Line)	..	76
530	To Crater (Sink of Perry Basin)	12	88
600*	Mouth of San Diego Pass	8	96
1,140*	Porphyry Butte	6	102
1,500*	Lucky Gap	4	106
	Quartz Point	1	107
2,000*	Summit of Bullion Range (San Diego Pass)	6	113
1,500*	Morongo Basin	10	123
	(Morongo Sink, estimated elevation 1,300 to 1,500 feet)	..	..
	Antelope Ridge	8	131
	Bunch Grass Mountain	4	135
2,327*	Morongo Pass (Summit)	10	145
1,677*	Head of Morongo Cañon	3	148
1,201*	Foot of Morongo Cañon (Coahuilla Valley)	7	155
1,101	Mouth of San Gorgonia Pass	10	165
2,808	San Gorgonia Pass (Summit)	22	187
Tide-water.	San Diego (distance, estimated on straight line, is 80 miles)	100	287

Distance from Colorado River to San Bernardino, 213 miles; elevation, 1,118 feet above tide. (Valley of Santa Anna.)

* Estimated.

General Table of Distances between New York, San Francisco, and San Diego, by Kansas Pacific Railway and 35th Parallel.

Route.	From	To Kansas City.	To Sheridan, end of Track K.P.R.W. 1868.	To Denver.	To Pecos River, near Anton Chico.	To Cañon Blanco, summit of Rocky Mountains.	To crossing of Rio Grande.	To Navajo Pass, Continental Divide.	To Colorado River, near Fort Mojave.	To Tehachapa Pass, summit of Sierra Nevada.	To Gilroy (end of Track Southern Pacific Railway), 1868.	To San Francisco.	To San Diego.
		Miles.	Miles.	Miles.	Miles.	Miles.	Isletta. Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.
1. *Via* Raton Mountain, Tejeras Cañon, and Partridge Creek.	Kansas City	...	405	630	781	811	871	993	1,451	1,701	1,946	2,026	1,738
	St. Louis	275	680	905	1,056	1,086	1,146	1,268	1,726	1,976	2,221	2,301	2,013
	Chicago	488	893	1,118	1,269	1,299	1,359	1,481	1,939	2,189	2,434	2,514	2,226
	New York	1,318	1,723	1,948	2,099	2,129	2,189	2,311	2,769	3,019	3,264	3,344	3,056
2. *Via* Raton Mountain, Tejeras Cañon, Isletta, and Mesa Gap.	Kansas City	...	405	630	781	811	Isletta. 871	993	1,419	1,669	1,914	1,994	1,706
	St. Louis	275	680	905	1,056	1,086	1,146	1,268	1,694	1,944	2,189	2,269	1,981
	Chicago	488	893	1,118	1,269	1,299	1,359	1,481	1,907	2,157	2,402	2,482	2,194
	New York	1,318	1,723	1,948	2,099	2,129	2,189	2,311	2,737	2,987	3,232	3,312	3,024
3. *Via* Raton Mountain, San Felipe, San Mateo, and Mesa Gap.	Kansas City	...	405	630	781	811	San Felipe. 868	968	1,394	1,644	1,889	1,969	1,681
	St Louis	275	680	905	1,056	1,086	1,143	1,243	1,669	1,919	2,164	2,244	1,956
	Chicago	488	893	1,118	1,269	1,299	1,356	1,456	1,882	2,132	2,377	2,457	2,169
	New York	1,318	1,723	1,948	2,099	2,129	2,186	2,286	2,712	2,962	3,207	3,287	2,999
4. *Via* Puntia Pass, Isletta, and Mesa Gap.	Kansas City	...	...	...	...	...	Isletta. 945	1,067	1,493	1,743	1,988	2,068	1,780
	St. Louis	...	...	...	...	...	1,220	1,342	1,768	2,018	2,263	2,343	2,055
	Chicago	...	...	...	...	...	1,433	1,555	1,981	2,231	2,476	2,556	2,268
	New York	...	...	...	...	...	2,263	2,385	2,811	3,061	3,306	3,386	3,098
5. *Via* Puntia Pass, San Felipe, San Mateo, and Mesa Gap.	Kansas City	...	405	630	...	...	San Felipe. 903	1,003	1,429	1,679	1,924	2,004	1,716
	St. Louis	275	680	905	...	...	1,178	1,278	1,704	1,954	2,199	2,279	1,991
	Chicago	488	893	1,118	...	...	1,391	1,491	1,917	2,167	2,412	2,492	2,204
	New York	1,318	1,723	1,948	...	...	2,221	2,321	2,747	2,997	3,242	3,322	3,034
6. *Via* Aubrey Route, San Felipe, San Mateo, and Mesa Gap.	Kansas City	...	...	...	746	776	San Felipe. 833	933	1,359	1,609	1,854	1,934	1,646
	St. Louis	...	...	...	1,021	1,051	1,108	1,208	1,634	1,874	2,129	2,209	1,921
	Chicago	...	...	...	1,234	1,264	1,321	1,421	1,847	2,097	2,342	2,422	2,134
	New York	...	...	...	2,064	2,094	2,151	2,251	2,677	2,927	3,172	3,252	2,964
7. *Via* Cimarron, San Felipe, San Mateo, and Mesa Gap.	Kansas City	...	...	...	709	739	San Felipe. 796	896	1,322	1,572	1,817	1,897	1,609
	St. Louis	...	...	...	984	1,014	1,071	1,171	1,597	1,847	2,092	2,172	1,884
	Chicago	...	...	...	1,197	1,227	1,282	1,384	1,810	2,060	2,305	2,385	2,097
	New York	...	...	...	2,027	2,057	2,114	2,214	2,640	2,890	3,135	3,215	2,927

TABLES OF DISTANCES THROUGH SONORA AND CHIHUAHUA.

No. 1.

From Camp Grant to Tucson (west of Sierra Santa Catarina)..... 54 miles.

No. 2.

From	Miles.	
Sacaton	..	
To Oneida Station	11·10	Wood, water, and grass.
Blue Water	9·70	No wood; sometimes water, grass.
Pecacho (point of mountain)	39·10	Wood, water, and grass.
Tucson	15·00	Water, wood; no grass.
	74·90	

No. 3.—DISTANCES FROM TUCSON TO THE PORT OF LIBERTAD (GULF OF CALIFORNIA) *viâ* ARIVACA, Z'AZABE, AND ALTAR. Measured by Major D. FERGUSSON, U.S.

From	Miles.	Total Miles.	
Tucson to—			
Mission of San Xavier del Bac	8·89	..	Good road; wood, water, and grass.
El Rancho Viejo	1·71	10·60	Good road; wood, water, and grass.
Punto del Agua.....	·79	11·39	Good road; wood, water, and grass.
Sahuarito, or Columbus	8·38	19·77	Good road; wood, water, and grass.
Roade's Ranche.....	8·56	28·33	Good road; wood, water, and grass.
Los Taraises	2·82	31·15	Good road; wood, water, and grass.
Reventon, or Kitchen's Ranche	2·98	34·13	Good road; wood, water, and grass.
Sopori Rancho	5·70	39·83	Good road; wood, water, and grass.
Mina Colorada	11·36	51·19	Good road; wood, water, and grass.
Arivaca	7·76	58·95	Good road; wood, water, and grass.
Los Alamos, or Old Arivaca..	·50	59·45	Good road; wood, water, and grass.
Covodepe Cuesta	6·13	65·58	Good road; wood, water, and grass.
Spring in the bed of Arroyo	5·39	70·97	Good road; wood; water scarce.
Z'Azabe	8·62	79·59	Good road; wood, water, and grass.
Charco de los Mesquites	6·42	86·01	No water.
Tecalote Trail	·08	86·09	
Charco.....	4·58	90·67	Water, wood, and grass.
Rancheria	2·27	92·93	Good grass.
Forks of Road	·50	93·43	
Forks of Road	·35	93·78	
Ascent to Mesa	·95	94·73	
Tinaja, or Charco	6·39	101·12	Water, wood, and grass.
Los Paredones	15·01	116·13	Good road; wood, water, and grass.
Jesus Maria	14·73	130·86	Good road; water, wood; grass scarce.
Altar	8·58	139·44	Good road; grass scarce; wood, water.
Dry Arroyo	4·05	143·49	Good road.
Road to Zepedas Ranche	6·20	149·69	Good road.
Foot of Hill	2·23	151·92	Good hard road.
Summit of Hill	·36	152·28	
Pitiquito.....	1·16	153·44	Good hard road; wood, water, grass.
Cienega and Caborca Road ..	7·59	161·03	Good hard road.
Laguna Mosca	5·00	166·03	Good hard road; no water in dry season; good grass.
Bajia de Aquituna.....	6·58	172·61	Good level road; wood and grass; no water.
El Zanjon (dry arroyo)	2·97	175·58	Good road; wood and grass.
Tinaje del Viejo	7·39	182·97	Water.
Angostura Pass	7·17	190·14	Good hard road; wood, water, grass.
Picu.....	11·14	201·28	Good hard road; wood, water, grass.
Pozo de las Cristolas.....	·57	201·85	
Charco de los Papagos.....	1·00	202·85	
Tinaja del Tule	4·12	206·97	Very little water or grass.
Derisadero Prieto	4·50	211·47	Good hard road; wood; no grass.
Point where Gulf is first seen	·83	212·30	
Port of Libertad	21·93	225·23	Wood, water; no grass; road bad.

No. 4.—DISTANCES FROM TUCSON TO GUAYMAS, *vid* TUBAC AND HERMOSILLO.

From	Miles.	Total Miles.	
Tucson to—			
San Xavier del Bac	9	9	Wood, water, and grass.
Agua de la Canoa	25	34	Wood, water, and grass.
Ford of Santa Cruz River ..	12	46	Wood, water, and grass.
Tubac	2½	48½	Wood, water, and grass.
Rancho de las Calabasas	13	61½	Wood, water, and grass.
Agua Zarca	23¼	84¾	Wood, water, and grass.
Cibuta	11¼	96	Wood, water, and grass.
La Casita	3½	99½	Wood, water, and grass.
Los Alisos Rancho	3½	103	Wood, water, and grass.
Imures	11½	114½	Wood, water, and grass.
San Ignacio	6½	121	Wood, water, and grass.
La Magdalena	5	126	Wood, water, and grass.
Santa Anna	12	138	Wood, water, and grass.
Barajita	13	151	Bad water, wood, and grass.
Rancho Querobabi	12	163	Wood and grass; water in tanks.
Rancho de Tabique	36	199	Wood and grass; water in tanks.
Hacienda de la Labor	28	227	Wood, water, and grass.
Hacienda de Alamita	8	235	Wood, water, and grass.
Hermosillo	13	248	Wood, water, and grass.
Rancho de la Poza	16	264	Wood, water, and grass.
Rancho de la Palma.....	16⅜	280⅜	Wood, water, and grass.
Rancho del Posito.....	8	288⅜	Water often scarce.
Rancho de la Cunequita	15¾	304⅛	Good water, &c.
Rancho de la Moche Buena..	19⅝	323¾	Water sometimes scarce.
Rancho del Caballo	9	332¾	Wood, water, and grass.
Guaymas	10¼	343	

No. 5.—DISTANCES FROM SAN XAVIER DEL BAC TO FRANKLIN (RIO GRANDE).

From	Miles.	Total Miles.
San Xavier del Bac to—		
Cienega de los Pimas	24·	..
San Pedro River	23·52	47·52
Quercus Cañon	6·	53·52
Playa de los Pimas (Croton Spring)	30·76	84·28
Fort Bowie	30·	114·28
Cienega del Sauz	25·30	139·58
Ojo de la Vaca	54·05	193·63
Rio Miembres	17·	210·63
Cooke's Spring	17·60	228·23
La Mesilla	53·11	281·34
Fort Fillmore.....	2·50	283·84
Franklin.....	40·	323·84

No. 6.—DISTANCES FROM FORT YUMA TO ALTAR, ACROSS THE SONORA DESERT.

From	Miles.	Total Miles.
Fort Yuma to—		
Leave Rio Gila	2·63	..
Las Cuevitas	26·45	29·08
Las Tinajas Altas	16·49	45·57
El Corral	15·33	60·90
El Tule	1·15	62·05
La Salada	44·89	106 94
Agua Dulce	2·89	109·83
Quitobaquita	6·54	116·37
Santo Domingo	5 70	122·07
Rancho de Sonoyta	7·73	129 80
Pozo del Macias	47·15	176·95
Rancho del Soñi	8·70	185·65
Las Caborqueñas	22·69	208·34
Rancho del Bamori	15·83	224·17
Las Tinajitas	6·73	230·90
Altar	4·65	235·55

No. 7.—DISTANCES FROM ALTAR (SONORA) TO EL PASO (NEW MEXICO), *vid* COCOSPERA, GUADALUPE CAÑON, AND JANOS.

From	Miles.	Total Miles.
Altar to—		
Charco de San Raphael	8·	..
Rancho del Ocuca	18·4	26·4
Santa Anna	21·38	47·78
Imures	23·68	71·46
Rancho de Babasaqui	5·	76·46
Cocospera	15·81	92·27
San Lazaro	17·28	109·55
Santa Cruz	7·18	116·73
First Tributary of the Rio San Pedro	13·50	130·23
Second Tributary of the Rio San Pedro	16·	146·23
Third Tributary of the Rio San Pedro	1·97	148·20
Fourth Trilutary of the Rio San Pedro	0·50	148·70
Fifth Tributary of the Rio San Pedro	3·	151·70
Sixth Tributary of the Rio San Pedro	9·81	161·51
Ash Creek	22·32	183·83
San Bernardino	30·16	213·99
Entrance of Guadalupe Cañon	9·27	223·26
Spring in Cañon	12·73	235·99
San Lino Spring	11·70	247·69
San Francisco Spring	16·10	263·79
Pelatado	27·13	290·92
Janos	10·50	301·42
Corralitas	20·26	321·68
Mines of San Pedro	19·	340·68
Santa Maria	27·18	367·86
Salado	27·	394·86
Salamurca	36·31	431·17
El Paso	25·02	456·19

No. 8.—DISTANCES FROM ALTAR, *viâ* OQUITOA, EL ATIL, TUBATAMA, AND ZARIC, IN SONORA, MEXICO, TO TUCSON, ARIZONA. Measured by Major DAVID FERGUSSON, First Cavalry, California Volunteers.

From	Miles.	Total Miles.	
Altar to—			
Oquitoa	6·20	..	Good hard smooth road; grass scarce; water and wood abundant.
Gonzales' Mill	1·23	7·43	Good hard smooth road; grass scarce; water abundant.
El Rancho Realito	1·94	9·37	Good hard smooth road.
El Atil	8·48	17·85	Hard road; some grass, wood, water.
Santa Teresa	4·13	21·98	Good road; grass, wood, and water.
First Crossing of River	·61	22·59	Good hard road.
River Bottom	·85	23·44	Sandy road.
La Puenta	·91	24·35	
Tubatama	1·56	25·91	Fair road.
Ford of River	·30	26·21	
Moreno's Mill	·46	26·67	
Zigzags	·52	27·19	
Descent into Valley	1·46	28·65	
El Ranchito	·85	29·50	
Top of Hill	1·11	30·61	
Top of Hill near Estancio	1·97	31·68	
El Estancio (Rancho)	·48	32·16	Rocky road; water and grass abundant.
Van Alstine's Ranche	1·14	33·30	Wood, water, and grass abundant.
Forks of Road	3·05	36·35	
Babocomari Hill	1·87	38·22	
Babocomari Ranche	1·27	39·49	
Cañon de Quimori	3·58	43·07	
Saric, or Zaric	·54	43·61	Good hard road; good grass, water.
Las Galeritas	3·46	47·07	Rough road; wood and water.
Rancho de Busani	1·79	48·86	Good hard road; wood, water, grass.
Forks of Road	3·16	52·02	
Charco de los Fusones	8·00	60·02	Hard level road; grass, wood, water.
Agua Escondida	1·32	61·34	Good level road; wood, water, grass.
La Tinaja	2·91	64·25	Fine level road; water, wood, grass.
Las Tres Bellotas	4·90	69·15	
Arivaca and Tubatama Trail	1·09	70·24	
Foot of Hill	1·33	71·57	Road good and hard; grass and wood.
First Bench of Hill	·30	71 87	Steep hill; fine grazing.
Summit	1·61	79·48	
Foot of Hill	·57	80·05	
Arivaca Trail	1·03	81·11	
Las Jarretillas	1·21	82·32	Water in spring; fine grass, wood.
Angle in Road	·80	83·12	
Mouth of Cañon	·70	83·82	Grass, wood; road tortuous and stony.
Mina de Logavina	·48	84·30	Fair road.
Las Fraguitas	·30	84·60	Road rocky and winding; no water.
Hill above Arivaca Valley	·74	85·34	
Arivaca	2·03	87·37	Good road; fine grass, wood, water.
Tucson	58·95	146·32	Good road.

No. 9.—ROUTES PRACTICABLE FOR A RAILWAY TO GUAYMAS, WITH COMPUTED DISTANCES FROM RAILROAD PASS AND SACATON.

	Miles.
1st. From Railroad Pass, *viâ* Rio San Pedro, Cocospera, Imures, Hermosillo..	428
2nd. From Railroad Pass, *viâ* Cienega de los Pimas, Rio Santa Cruz, Tubac, Imures, and Hermosillo.....	418
3rd. From Railroad Pass, *viâ* Cienega de los Pimas, Arivaca, Z'Azabe Valley, Altar, Hermosillo	429
4th. From Sacaton (Rio Gila), *viâ* Cababi Mines, Fresnal, Altar, Hermosillo..	394

No. 10.—TOTAL DISTANCE FROM NEW YORK TO SAN DIEGO AND GUAYMAS.

By 32nd parallel to Guaymas—

	Miles.
New York to Kansas City	1,318
Kansas City to Rio Grande (between Albuquerque and Isletta)	799
To Fort Craig	102
Railroad Pass.....	204
San Pedro Crossing	46
Tubac	58
Calabasas	13
Los Nagdales	8
Imures.....	49
La Magdalena	11
Hermosillo	110
Guaymas	86
Total.....	2,804

	Miles.
By 35th parallel from New York to San Diego	2,927
By 32nd parallel from New York to San Diego (by Warner's Pass)	2,96

No. 11.—DISTANCES FROM JANOS (CHIHUAHUA) TO OJO DE VACA (NEW MEXICO). Furnished by Mr. CHANDLER, of the Mexican Boundary Commission.

From	Miles.	Total Miles.
Janos to—		
Las Lagunitas	8·7	..
Palos Blancos	13·8	22·5
Espia	14·1	36·6
Desechado	18·8	55·4
Carrizzalillo	19·3	74·7
Mountain Point	22·6	97·3
Ojo de Vaca	20·	117·3

No. 12.—DISTANCES FROM MESILLA, NEW MEXICO, TO THE CITY OF CHIHUAHUA, MEXICO, *vid* EL PASO. Measured by Major DAVID FERGUSSON, First Cavalry, California Volunteers.

From	Miles.	Total Miles.	
Mesilla to—			
Fort Fillmore	6·65	..	Fair road.
Texas Boundary Line	17·00	23·65	Fair road; wood, water, and grass.
Hart's Mill	19·53	43·18	Fair road.
Franklin	1·20	44·38	Wood, water, and grass procurable.
Puerto de los Indios	9 79	54·17	Good hard road; water and wood.
La Ciga	11·84	66·01	Good hard road; thin grass.
Point of Low Sierra	6·52	72·53	Good hard road; grama grass.
Samalaguca	9·00	81·53	Good road, good grass, wood; no water.
Top of low Hill	3·22	84·75	Grass *en route*.
Sand Hills	1·05	85·80	Fair road.
End of Meadow	3·71	89·51	Road sandy; wood and grass.
Dry Camp	1·58	91·09	Road sandy and heavy; no water; grass and wood.
El Lucero	29·06	120·15	Road sandy; wood, water, and grass abundant.
La Laguna	5·88	126·03	Good road; grass and wood; warm sulphur water.
Carrisal	15·04	141·07	Road level; grass, wood, and water.
Ojo Caliente	11·52	152·59	Road level; good grass, wood, water.
Arroyo del Carmen	1·43	154·02	Good road.
Dry Camp	22·58	176·60	Good road through grass valley.
Gallego	19·58	196·18	Good hard road; no water; good grass and wood.
Dry Camp	11·42	207·60	Fine hard road; wood and grass.
Forks of Encenillas	7·33	214·93	Fine hard road; grass.
Arroyo del Sauz	24·53	239·46	Good level road; fine grass, water, and wood.
Pinolito	3·34	242·80	Good level road; grass and water.
El Sauz	6·14	248·94	Good level road; grass and water.
Sacramento	13·87	262·81	Good level road; grass abundant; wood.
El Salitre	8·87	271·68	Fine hard level road; grass scarce.
Chihuahua	8·23	279·91	Fine hard smooth road.

APPENDIX C.

PHOTOGRAPHY.

As by far the greater proportion of travellers who start on their journeys through remote regions with the necessary chemicals and apparatus for taking photographic views do not succeed unless they have previously become thoroughly acquainted with the art, I will here give the formulæ which were written out for me by my friend Mr. Browne, and which did me good service all through my trip. I am sure they will be found most useful to those who desire to take views of what they see, and are, like myself, unacquainted with photography.

THE GLASS.

Take off the sharp edges by rubbing them against each other. Clean with water and wipe dry, then rub with alcohol and flannel, and polish with a silk duster. Brush off the dust with a camel's-hair brush.

THE COLLODION.

Iodide of ammonia	5 grains.
Bromide of cadmium, or magnesium	2½ ,,
Alcohol	1 ounce.
Ether	½ ,,

Pary's gun-cotton, 7½ grains to the ounce of mixture.

NEGATIVE BATH.

Fused nitrate of silver	45 grains.
Water	1 ounce.

Add 5 grains of iodide of silver, or let a coated plate remain in the bath overnight; make it very slightly *acid with pure nitric acid*. Filter.

DEVELOPER.

Protosulphate of iron	20 grains.
Acetic acid, No. 8	2 drachms.
Water	1 ounce.

In warm weather add equal parts of cold water, to reduce the strength of the iron, and then filter.

After developing with iron, should the negative not be strong enough to print, wash well, and pour over it the following solution of citrate of silver :—

Citric acid	30 grains.
Nitrate of silver	20 „
Water	1 ounce.

Divide the water into equal parts ; to one portion add the citric acid, and the nitrate of silver to the other ; when dissolved, pour the solutions together. Filter and use.

To strengthen a negative, pour from the stock bottle about half an ounce of citrate of silver into a small bottle, flow it over the plate, drain (the solution may be used several times), and redevelop with iron developer ; in warm weather diluting the strength of iron to 10 grains to the ounce. Keep the developer moving over the plate, watching carefully so that no fogging takes place. Of course this must be done in the dark room. By this treatment the negative will quickly be made strong enough to print without losing the middle tints. Wash well and fix.

FIXING SOLUTION.

Hyposulphate of soda, saturated solution.

PRINTING PROCESS.

SILVER SOLUTION.

Nitrate of silver	80 grains.
Water	1 ounce.

Add ammonia carefully, until there is a heavy precipitate of oxide of silver, then clear up with nitrate of ammonia, and add half an ounce of alcohol to the pint of bath. Filter and use. Do not let the silver fall below 60 grains to the ounce ; test with a standard solution of salt, as the hydrometer will not give the correct amount of silver. This bath will keep perfectly clear. I have had the same solution in use over two years, of course strengthening it frequently, never adding silver alone, but using a larger amount of silver, say 100 or 200 grains to the ounce of water, also increasing the proportion of ammonia and alcohol. This is done to prevent a large bulk of solution.

Other baths were found to work as well as this formula, but each had a tendency to become clouded.

The great recommendation of this process for amateurs is, that the bath may be put aside for one month or twenty ; at either time it will be found perfectly clear and ready for use, only requiring filtering as a matter of prudence, there being a very slight deposit in the bottom of the bottle after standing.

Float the papers from one to three minutes ; it will answer for either plain or albumen papers. Dry perfectly, and expose to the fumes of ammonia for ten minutes.

TONING.

For the last five years I have entirely given up the use of chloride of gold in a crystallised form, using instead an acid solution of gold, prepared in the following manner :—Having obtained a solution of metallic gold, of a known

amount, in aqua regia, evaporate in a sand-bath until the solution appears like syrup, then dilute with water, in the proportion of 1 grain of gold to the drachm of water; filter, and it will be ready for use. No change or precipitation of gold can take place, so that the bottle is always in good order.

TONING BATH.

Warm water	8 ounces.
Chloride of gold	2 drachms.

Neutralise carefully with ammonia. Do not get an excess, or the prints will be liable to blister, then add 30 grains of salt.

Wash the prints well before toning, then place them in a dish of warm water, putting half-a-dozen at a time into the toning bath. Almost any colour desired may be obtained.

Of all the many toning processes given to the public—some very complicated ones among them—none, I think I am correct in saying, gives more certain or better results than the old alkaline bath. Some very strong prints are possibly improved by the addition of a small quantity of nitrate of uranium. This chemical is, however, tricky and unreliable. Wash for half an hour, and fix.

FIXING SOLUTION.

Hyposulphate of soda	1 ounce.
Water	6 ounces.

When the hyposulphate is dissolved, add to it three or four drops of ether; wash thoroughly. If possible, use warm water in the last washing.

* * * * * * *

The climate in which I worked was usually so dry that I had to use my collodion much diluted with ether; and so alkaline was the water in many places, that the thin film became, when washed, even thinner; and the negative, although it was *usually full of detail*, was not strong enough for ordinary printing; and what I gained by strengthening, I lost again by rewashing with the bad water. Such negatives should be kept as they are, *and never destroyed*, for they are the very best from which to take sunlight enlargements afterwards.

When my bromide of cadmium failed, I replaced it with iodide of potassium, and obtained quite as good results with landscapes, with the advantage of having a more permanent collodion. The softest pictures were, however, from the bromide of magnesium collodion, although this will not keep more than a fortnight. I found the first hour after sunrise and the last before sunset to be the best for taking views, as the air was calm and clear, and the temperature low.

THE END.

PRINTED BY VIRTUE AND CO., CITY ROAD, LONDON.

193, PICCADILLY,
May, 1869.

NEW AND FORTHCOMING BOOKS

PUBLISHED BY

CHAPMAN AND HALL.

JOHN FORSTER.

NEW WORK BY THE AUTHOR OF THE "LIFE OF GOLDSMITH," "LIFE OF SIR JOHN ELIOT," &c.

WALTER SAVAGE LANDOR; A BIOGRAPHY.

1775–1864.

By JOHN FORSTER.

Two Volumes, Post 8vo., with Portraits and Vignettes, 28*s*.

[*On May 15th.*

COMMANDER BEDFORD PIM, R.N., AND DR. SEEMANN.

DOTTINGS ON THE ROADSIDE,

IN THE

ISTHMUS OF PANAMA, CENTRAL AMERICA,

AND THE

MOSQUITO COUNTRY.

BY

COMMANDER BEDFORD PIM, R.N., F.R.G.S., &c.,

AND

DR. BERTHOLD SEEMANN, F.L.S., F.R.G.S.

Illustrated with Plates and Maps. [*Nearly ready.*

G. J. WHYTE MELVILLE.

In One Volume, Crown 8vo.

SONGS, VERSES, &c. By G. J. Whyte Melville. [*In the press.*

GEORGE FLEMING, R.E.

HORSESHOES AND HORSESHOEING: their History, Traditions, Uses, and Abuses. By George Fleming, Veterinary Surgeon, Royal Engineers. [*In the press.*

Demy 8vo, with 200 Engravings.

THOMAS CARLYLE.

Messrs. CHAPMAN and HALL beg to announce an entirely New Edition of the whole of Mr. CARLYLE'S WORKS, to be completed in Thirty Volumes. It will be carefully revised by the Author, handsomely printed in demy 8vo., with Portraits, Maps, &c., and entitled

THE LIBRARY EDITION OF THE
COLLECTED WORKS OF THOMAS CARLYLE.

Volumes already published :—

SARTOR RESARTUS:
THE LIFE AND OPINIONS OF HERR TEUFELSDRÖCH.

With a Portrait of the Author. Price 7*s.* 6*d.*

THE FRENCH REVOLUTION.
3 vols. Price 9*s.* each.

THE LIFE OF SCHILLER.
With Portrait and Illustrations. Price 7*s.* 6*d.* [*May* 15*th*

Each Work will be complete in itself.

THOMAS CARLYLE'S WORKS. CHEAP EDITION.

THE FRENCH REVOLUTION: A History. In 2 vols. 12*s.*

OLIVER CROMWELL'S LETTERS AND SPEECHES, with Elucidations, &c. 3 vols. 18*s.*

LIFE OF JOHN STERLING
LIFE OF SCHILLER } 1 vol. 6*s.*

CRITICAL AND MISCELLANEOUS ESSAYS. 4 vols. 1*l.* 4*s.*

SARTOR RESARTUS
HERO WORSHIP } 1 vol. 6*s.*

LATTER-DAY PAMPHLETS. 1 vol. 6*s.*

CHARTISM
PAST AND PRESENT } 1 vol. 6*s.*

TRANSLATIONS OF GERMAN ROMANCE. 1 vol. 6*s.*

WILHELM MEISTER, by Göthe; a Translation. 2 vols. 12*s.*

HISTORY OF FRIEDRICH THE SECOND, called Frederick the Great. New edition with Maps. 7 vols. crown 8vo., price 7*s.* each.

SHOOTING NIAGARA, AND AFTER? By Thomas Carlyle. Crown 8vo., sewed, 6*d.*

INAUGURAL ADDRESS AT EDINBURGH, April 2, 1866, on being installed as Rector of the University there. By Thomas Carlyle. Sewed, 1*s.*

Nearly ready, in Two handsome Volumes, Demy 8vo.

New Tracks in North America: being a Narrative of Explorations, Travels, and Adventures in the South-Western Territories of the United States. Containing an Account of the Aztec Inhabitants, and the Results of the recent Survey for a Southern Railway to the Pacific Ocean.

By Dr. W. A. BELL, F.R.G.S.

With Twenty Lithographic Illustrations and numerous Woodcuts.

CHARLES DICKENS.

ILLUSTRATED LIBRARY EDITION, with the Original Illustrations.

OUR MUTUAL FRIEND. 2 vols. post 8vo. 16*s.*
PICKWICK PAPERS. 43 Illustrations. 2 vols. 16*s.*
NICHOLAS NICKLEBY. 40 Illustrations. 2 vols. 16*s.*
MARTIN CHUZZLEWIT. 40 Illustrations. 2 vols. 16*s.*
DOMBEY AND SON. 40 Illustrations. 2 vols. 16*s.*
DAVID COPPERFIELD. 40 Illustrations. 2 vols. 16*s.*
BLEAK HOUSE. 40 Illustrations. 2 vols. 16*s.*
LITTLE DORRIT. 40 Illustrations. 2 vols. 16*s.*
OLD CURIOSITY SHOP and REPRINTED PIECES. 36 Illustrations. 2 vols. 16*s.*
BARNABY RUDGE and HARD TIMES. 36 Illustrations. 2 vols. 16*s.*
SKETCHES BY BOZ. 40 Illustrations. 1 vol. 8*s.*
OLIVER TWIST. 24 Illustrations. 1 vol. 8*s.*
CHRISTMAS BOOKS. 17 Illustrations. 1 vol. 8*s.*
A TALE OF TWO CITIES. 16 Illustrations. 1 vol. 8*s.*
GREAT EXPECTATIONS. 8 Illustrations. 1 vol. 8*s.*
PICTURES FROM ITALY and AMERICAN NOTES. 8 Illustrations. 1 vol. 8*s.*

THE "CHARLES DICKENS" EDITION.

In 18 vols. royal 16mo., with Illustrations. Handsomely bound in bevelled cloth, price 2*l.* 18*s.* the set; or in Roxburgh binding, price 3*l.* 10*s.*

Volumes at 3s. 6d.

THE PICKWICK PAPERS.
MARTIN CHUZZLEWIT.
DOMBEY AND SON.
NICHOLAS NICKLEBY.
DAVID COPPERFIELD.
BLEAK HOUSE.
LITTLE DORRIT.
OUR MUTUAL FRIEND.

Volumes at 3s.

OLIVER TWIST.
OLD CURIOSITY SHOP.
BARNABY RUDGE.
CHRISTMAS BOOKS.
A TALE OF TWO CITIES.
SKETCHES BY BOZ.
AMERICAN NOTES, AND REPRINTED PIECES.
GREAT EXPECTATIONS.
HARD TIMES, AND PICTURES FROM ITALY.
THE UNCOMMERCIAL TRAVELLER.

The above are sold separately, bound in red cloth.

CHEAP AND UNIFORM EDITION, with Frontispieces.

1. THE PICKWICK PAPERS. 5*s.*
2. NICHOLAS NICKLEBY. 5*s.*
3. MARTIN CHUZZLEWIT. 5*s.*
4. DOMBEY AND SON. 5*s.*
5. DAVID COPPERFIELD. 5*s.*
6. BLEAK HOUSE. 5*s.*
7. LITTLE DORRIT. 5*s.*
8. OUR MUTUAL FRIEND. 5*s.*
9. BARNABY RUDGE. 4*s.*
10. OLD CURIOSITY SHOP. 4*s.*
11. OLIVER TWIST. 3*s.* 6*d.*
12. SKETCHES BY BOZ. 3*s.* 6*d.*
13. CHRISTMAS BOOKS. 3*s.* 6*d.*
14. GREAT EXPECTATIONS. 3*s.* 6*d.*
15. HARD TIMES and PICTURES FROM ITALY. 3*s.* 6*d.*
16. THE UNCOMMERCIAL TRAVELLER. 3*s.*
17. A TALE OF TWO CITIES. 3*s.*
18. AMERICAN NOTES. 2*s.* 6*d.*

In May. In One Volume, Demy 8vo.

Forest Life in Acadie. Sketches of Sport and Natural History in the Lower Provinces of the Canadian Frontier. By Captain Campbell Hardy, R.A. With Illustrations.

GEORGE ROOPER.

FLOOD, FIELD, AND FOREST. By George Rooper. With Illustrations. Post 8vo. 8*s.*

"The story in 'Bolsover Forest' has a strong human interest . . . well constructed, energetically carried out, and essentially dramatic in its character. . . . We feel a personal obligation to Mr. Rooper for the pleasure his writings have afforded us."—*Land and Water.*

"The whole life of the fox . . . is told with great spirit and interest."—*Spectator.*

UBIQUE.

In the Press, in 1 vol., post 8vo.

ACCESSIBLE FIELD SPORTS. By Ubique.

GUN, ROD, AND SADDLE. Personal Experiences. By Ubique. Crown 8vo. 7*s.* 6*d.*

"The general public will fully enjoy these reminiscences of sport and adventure, which are told in a frank, straightforward way, without any attempt at effect, or any romantic embellishments."—*Athenæum.*

"Contains many valuable hints and suggestions, based on long practical experience, of which younger and more untried sportsmen may do well to avail themselves."—*Morning Post.*

"'Ubique's' book is well worth reading, and there is an air of candour about it that convinces us his most wonderful traveller's tales are facts not fictions."—*Pall Mall Gazette.*

R. ARTHUR ARNOLD.

FROM THE LEVANT, THE BLACK SEA, AND THE DANUBE. By R. Arthur Arnold, Author of "The History of the Cotton Famine," &c. &c. 2 vols, post 8vo. 20*s.*

"As a *dilletante* traveller we have nothing but praise for Mr. Arnold. He has an artist's eye, and the gift of making his reader share his admiration. He succeeds in reproducing lights and shadows as well as outline. . . . Mr. Arnold's descriptions are as lucid and as little dull as may be, and he brings far more classical lore to the hunting up the old classical memories than the average cultivated Englishman would carry with him. . . . We are sure he is always frank and honest: and what we want in 'Letters from the Levant' is truth even more than wisdom."—*Times.*

C. O. GROOM NAPIER.

TOMMY TRY, and what he did in Science. By Charles Otley Groom Napier (of Merchiston), F.G.S., &c. With 46 Illustrations engraved by J. D. Cooper and others. Crown 8vo. 6*s.*

"A good and pleasant little book is 'Tommy Try.' Besides conveying to youth information on subjects that invariably interest them, it is written in an airy spirit, well calculated to entice their attention."—*Daily Telegraph.*

E. C. TAINSH.

A STUDY OF THE WORKS OF ALFRED TENNYSON, D.C.L., Poet-Laureate. By Edward Campbell Tainsh. Second Edition, revised and corrected. Crown 8vo. 6*s.*

"Mr. Tainsh shows that he has a true love of the poet's art, and he writes both gracefully and thoughtfully. He has the right to speak which comes from an ardent appreciation of the beauties of his author, and an elaborate series of studies."—*Saturday Review.*

A. STEINMETZ.

THE ROMANCE OF DUELLING IN ALL TIMES AND COUNTRIES. By Andrew Steinmetz, Author of "The History of the Jesuits," &c. 2 vols, post 8vo. 21*s.*

WALTER WHITE.

A MONTH IN YORKSHIRE. By Walter White. Fourth Edition, with a Map. Crown 8vo. 4*s.*

A LONDONER'S WALK TO THE LAND'S END, and a Trip to the Scilly Isles. By Walter White. Second Edition, with 4 Maps. Crown 8vo. 4*s.*

In One handsome Volume, Imperial 8vo., price 42*s*.

Underground Life; or, Mines and Miners. By L. Simonin. Translated, adapted to the present state of British Mining, and edited by H. W. Bristow, F.R.S., of the Geological Survey; Hon. Fellow of King's College, London.

Illustrated with 160 Engravings on Wood, 20 Maps Geologically Coloured, and 10 Plates of Metals and Minerals in Chromo-lithography.

"Another splendid example of the works of 'vulgarisation' in a good sense, which France has been producing of late years for the rest of the world. This is perhaps the most complete and beautiful of the whole group. The illustrations consist of 160 engravings on wood, most of them excellent; 20 maps geologically coloured, and 10 chromo-lithographic plates of ores and other minerals. These last are quite the most brilliant diagrams of the kind that we have ever seen. . . . . In conclusion, we have only to say that this book is full of information, conveyed in an attractive way, and illustrated with the utmost completeness and beauty."—*Pall Mall Gazette.*

PROFESSOR HENRY MORLEY.

ENGLISH WRITERS. By Henry Morley. Demy 8vo.

Vol. I., Part 1. CELTS AND ANGLO-SAXONS, with an Introductory Sketch of the Four Periods of English Literature. 12*s.*

Vol. I., Part 2. FROM THE CONQUEST TO CHAUCER. 10*s.*

Vol. II., Part 1. FROM CHAUCER TO DUNBAR. 12*s.*

"Mr. Morley has a sense of the duty and dignity of his task, and he is evidently prepared for a commensurate effort to perform it successfully . . . . . We have confined ourselves to the Introduction of nearly 120 pages, which, as it is the vestibule only of the entire edifice, only permits the reader to see the outline and plan of the projected work. There are 600 or 700 pages more in this volume, in which lie the detailed fruits of Mr. Morley's research, erudition, and critical judgment . . . . In fact, he does not appear to have overlooked any one important work from the very earliest, whatever that may have been: and the extent to which he describes and analyzes some of these will make his book a most valuable addition to our libraries when it is the important whole, of which this is the first and, perhaps, the most valuable instalment."—*Times.*

Also,

TABLES OF ENGLISH LITERATURE. By Henry Morley, Professor of English Literature, University College, London. Parts I. and II. 1*s.* 6*d.* each.

G. L. CRAIK.

OUTLINES OF THE HISTORY OF THE ENGLISH LANGUAGE, for the use of the junior classes in Colleges, and the higher classes in Schools. By George L. Craik. Sixth Edition, revised and improved. Crown 8vo. 2*s.* 6*d.*

THE ENGLISH OF SHAKESPEARE, Illustrated in a Philological Commentary on his Julius Cæsar. By George L. Craik. Fourth Edition, revised and corrected. Crown 8vo. 5*s.*

THOMAS BRADLEY.

ELEMENTS OF GEOMETRICAL DRAWING; or, Practical Geometry, Plane and Solid, including both Orthographic and Perspective Projection. Illustrated by 60 Plates, engraved by J. W. Lowry, from Original Drawings by Thomas Bradley, of the Royal Military Academy, Woolwich, and Professor of Geometrical Drawing at King's College, London. In two Parts, oblong folio. 16*s.* each.

A SELECTION of 30 Plates from the above, price 16*s.*

J. C. BUCKMASTER.

THE ELEMENTS OF MECHANICAL PHYSICS. By J. C. Buckmaster, &c., &c. Fcap. 8vo. 3*s.* 6*d.*

R. BURCHETT.

PRACTICAL GEOMETRY. A Course of Construction of Plane Geometrical Figures for the Use of Art-Schools. By R. Burchett, Head Master of the Training Schools for Art-Masters of the Science and Art Department. Post 8vo. 5*s.*

LINEAR PERSPECTIVE. For the use of Schools of Art. By R. Burchett, Head Master of the Training Schools for Art-Masters of the Science and Art Department. Post 8vo. 7*s.*

In One handsome volume, Demy 8vo., price 18*s*.

Our Life in Japan. By R. Mounteney Jephson and E. Pennell Elmhirst, 9th Regiment. With 20 Illustrations by Lord Walter Kerr, Signor Beato, and native Japanese Drawings.

A RUSTIC MAID.

"'Our Life in Japan' is just the book to be read on a summer day by a real idler, stretched out on the green sward, with a fragrant weed for a companion."—*Athenæum.*

"The incidents related in it are told in a good-tempered, cheery way, pleasant for all readers. The field events especially are described with vigour and freedom."—*Pall Mall Gazette.*

Rev. ALEXANDER DYCE.

The Works of William Shakespeare. The Text revised by the Rev. Alexander Dyce. 9 Vols., demy 8vo. With Portraits and Life. *4l. 4s.*

Vol. IX., being a Glossary to the above, is sold separately, price 12*s.*

"The best text of Shakespeare which has yet appeared. . . . Mr. Dyce's edition is a great work, worthy of his reputation, and for the present it contains the standard text."—*Times.*

"We have no space for more than a word of welcome to Mr. Dyce's new and beautifully-printed edition of the works of Shakespeare. As a critic of Shakespeare, Mr. Dyce combines qualifications which have never before met in one man; and, fearlessly following his own judgment, he is giving us an edition worthy of both editor and poet."—*Quarterly Review.*

"A comprehensive Glossary to Shakespeare, just issued, completes the notable edition of the poet's works, for which we are indebted to Mr. Dyce. To say that it is the best Glossary to Shakespeare yet published would be a measure of praise altogether inadequate to express the great merits of this compilation. In accuracy, felicity of explanation, and in all that constitutes the efficiency of such a work, we think that Mr. Dyce's Glossary will remain for a long time, as it certainly is at present, unrivalled."—*Athenæum.*

"The most valuable contribution made of late years to Shakespeare literature is decidedly Mr. Dyce's ninth volume. . . . To those who merely now and then take up Shakespeare it will be most useful; to those who study him, a necessity."—*Westminster Review.*

Hon. ROBERT LYTTON.

Chronicles and Characters. By Robert Lytton (Owen Meredith). In 2 vols., post 8vo. 24*s.*

"Whatever may have been the diversity of critical opinion as to the poetical worth of Mr. Lytton's first published volumes, no one can deny that 'Chronicles and Characters' eminently deserves that 'patient perusal' which the author says in his preface 'I presume not to hope from many readers,' but which, nevertheless, I claim as a preliminary to any final judgment of a work 'which has occupied nearly seven years of my life.' The range of these studies is so extensive, the subjects so diverse, that it is difficult in a limited space to give any sufficient idea of the depth of thought, the patient labour, and the genuine enthusiasm Mr. Lytton has brought to bear on nearly every page of his work. Seven years' labour has not been ill bestowed on volumes that will win him a rank and name in the hierarchy of English poets."—*Times.*

Orval, or, the Fool of Time; and other Imitations and Paraphrases. Fcap. 8vo. 9*s.*

Clytemnestra, and Poems Lyrical and Descriptive. New Edition. Fcap. 8vo. 6*s.*

Lucile. New Edition. Fcap. 8vo. 6*s.*

HENRY TAYLOR, D.C.L.

Philip Van Artevelde; a Dramatic Romance. In Two Parts. By Henry Taylor, D.C.L. Eighth Edition. Fcap. 8vo. 5*s.*

Edwin the Fair, and Isaac Comnenus. Fifth Edition. Fcap. 8vo. 5*s.*

A Sicilian Summer, St. Clement's Eve, The Eve of the Conquest, and other Poems. Foolscap 8vo. 5*s.*

Dr. J. A. CARLYLE.

Dante's Divine Comedy: the Inferno. A Literal Prose Translation, with the Text of the Original collated from the best Editions, and Explanatory Notes. By John A. Carlyle, D.D. Second Edition. Demy 8vo. 14*s.*

In One handsome Volume, Demy 8vo., price 16*s*.

Chefs-d'Œuvre of the Industrial Arts. By PHILIPPE BURTY. Pottery and Porcelain, Glass, Enamel, Metal, Goldsmiths' Work, Jewellery, and Tapestry. Carefully edited by W. CHAFFERS, F.S.A., and illustrated with Two Hundred Woodcuts.

From the BUILDER.

"We have just closed a volume we are sure most of our readers will open with pleasure. It is a translation of Mr. Burty's book, entitled 'Chefs-d'Œuvre of the Industrial Arts,' edited by Mr. Chaffers. With a graceful array of illustrations of some of the most delicate and elegant objects ever made. . . . . To look carefully over this work brings an impression into the mind exactly like that which occupies it after a long day spent in the South Kensington Museum, or in the Louvre, or in the Vatican."

THE AUTHOR OF "FLEMISH INTERIORS."

FEUDAL CASTLES OF FRANCE (Western Provinces). By the Author of "Flemish Interiors," &c. &c. Illustrated from the Author's Sketches. Demy 8vo. 14*s.*

"It only remains for us to say that the work is worthy of the author's excellent reputation."—*Daily Telegraph.*

GHEEL, the City of the Simple. By the Author of "Flemish Interiors." Crown 8vo. 6*s.*

"We confess that we never before heard of Gheel, and perhaps few readers have; but it is comforting to reflect that neither had the author until he came across it by sheer accident. Yet it is in Belgium, has been in existence for nearly twelve hundred years, and is one of the most extraordinary places in the world. It is nothing more or less than a large lunatic asylum, as opposed to a place of confinement for lunatics. In fact, it is a village; and the 'simple' are permitted to roam about at will, and unattended."—*Daily Telegraph.*

E. B. EASTWICK, C.B., F.R.S., &c.

VENEZUELA: OR, SKETCHES OF LIFE IN A SOUTH AMERICAN REPUBLIC; with the History of the Loan of 1864. By Edward B. Eastwick, C.B., F.R.S., late Secretary of Legation at the Court of Persia, &c. Demy 8vo., with Map. 16*s.*

"This work ought to be read by all who have business or other relations with South America, or who wish to make themselves acquainted with a country possessed of many important claims to European attention. The author is an experienced and pleasant writer, and quite carries the reader with him from point to point and from place to place."—*Brazil and River Plate Mail.*

ISABELLE SAXON.

FIVE YEARS WITHIN THE GOLDEN GATE (SAN FRANCISCO). By Isabelle Saxon. Post 8vo.

"Miss Saxon is sound on the question of slavery, and proves herself a gentlewoman of feeling and healthy instincts."—*Athenæum.*

"The simple confidence with which she exhibits her little Republican notions is very entertaining."—*Spectator.*

W. HEPWORTH DIXON.

THE HOLY LAND. By William Hepworth Dixon. With Illustrations from Original Drawings and Photographs. Fourth edition. Crown 8vo. 10*s.* 6*d.*

HOWARD HOPLEY.

UNDER EGYPTIAN PALMS; or, Three Bachelors' Journeyings on the Nile. By Howard Hopley. Crown 8vo. 8*s.*

DR. PAIJKULL.

A SUMMER IN ICELAND. By C. W. Paijkull, Professor of Geology at the University of Upsala. Translated by Rev. M. R. Barnard, B.A. Illustrated. Demy 8vo. 14*s.*

SIDNEY HALL.

A TRAVELLING ATLAS OF THE ENGLISH COUNTIES. By Sidney Hall. Fifty Coloured Maps. New Edition, with Railways to present time. Demy 8vo., roan tuck. 10*s.* 6*d.*

In One Volume, Demy 8vo., price 14*s*.

Feudal Castles of France (Western Provinces). By the Author of "Flemish Interiors." With Illustrations.

JOHN FORSTER.

THE LIFE AND TIMES OF OLIVER GOLDSMITH. By John Forster. Fourth Edition. With 40 Woodcuts. *7s. 6d.*

MARQUIS D'AZEGLIO.

RECOLLECTIONS OF MASSIMO D'AZEGLIO. Translated, with Notes and Introduction, by Count Maffei. In 2 vols., post 8vo. With Portrait. *1l. 4s.*

"Madame Ricci gave these papers to the world. In Italy, at least, they have been widely read and admired; and they are now published by Count Maffei in two volumes of racy, brisk, and idiomatic English, for which the Count deserves our heartiest thanks. Such a book, besides being fresh and winning in its style, is of solid moment in its matter. It is not only the record of a noble life, but the history of a great revolution; and those who wish to comprehend the New Italy should study in these pages the Old Italy out of which it has been made."—*Athenæum.*

THE LATE PROFESSOR KEYSER.

THE PRIVATE LIFE OF THE OLD NORTHMEN. Translated from the Posthumous Works of R. Keyser, late Professor of History at the Royal University in Christiania, Norway. By the Rev. M. R. Barnard, B.A.

"The book is a valuable contribution to Northern literature, as illustrative of the manners and customs of the Scandinavian races: and in an English dress will, we doubt not, be read by Englishmen, who care at all for serious literature, with no little pleasure and profit."—*Examiner.*

COLONEL CHURCHILL.

THE LIFE OF ABD EL KADER, Ex-Sultan of the Arabs of Algeria; written from his own dictation, and compiled from other authentic sources. By Colonel Churchill. Post 8vo. *9s.*

J. A. ST. JOHN.

LIFE OF SIR WALTER RALEIGH. 1552-1618. By James Augustus St. John. New Edition. In 1 vol. *10s. 6d.*

BARON MAX MARIA VON WEBER.

CARL MARIA VON WEBER, the Life of an Artist. From the German of his son, Baron Max Maria von Weber. By J. Palgrave Simpson, M.A. In 2 vols. Post 8vo. *1l. 2s.*

LIEUT.-COL. BLYTH.

THE WHIST-PLAYER. The Laws and Practice of Short Whist Explained and Illustrated. By Lieut.-Colonel B———. Third Edition, imp. 16mo. *5s.*

C. E. FRANCATELLI.

THE ROYAL CONFECTIONER: English and Foreign. A Practical Treatise on the Art of Confectionery in all its Branches. By Charles Elme Francatelli. Post 8vo. *9s.*

Sixth Thousand, in One handsome Volume, Demy 8vo.,
price 16*s*.

The World before the Deluge. By Louis Figuier.

With 25 Ideal Landscapes of the Ancient World, designed by Riou, and 208 Figures of Animals, Plants, and other Fossil Remains and Restorations. Third Edition. The Geological portion carefully revised, and much original matter added by H. W. Bristow, F.R.S., of the Geological Survey of Great Britain.

ERRATIC BLOCKS IN THE ALPS.

From the Athenæum.

"We find in the new edition of 'The World before the Deluge' a book worth a thousand gilt Christmas volumes, and one most suitable as a gift to intellectual and earnestly-inquiring students. Some inaccuracies in the first edition have been corrected and much new matter added under the able editing of Mr. Bristow."

EARL SHAFTESBURY, K.G.

SPEECHES OF THE EARL OF SHAFTESBURY, K.G., upon Subjects having relation chiefly to the Claims and Interests of the Labouring Class. With a Preface. Crown 8vo. 8*s.*

WALTER BAGEHOT.

THE ENGLISH CONSTITUTION. By Walter Bagehot. Reprinted from the "Fortnightly Review." Post 8vo. 9*s.*

"So full of true and sagacious thought that no one will ever again set himself to study the English Constitution without consulting it."—*Saturday Review.*

"Perhaps the most characteristic fact about this little book is that, dealing with such a subject, it should be very pleasant reading."—*Pall Mall Gazette.*

T. A. TROLLOPE.

A HISTORY OF THE COMMONWEATH OF FLORENCE, from the earliest Independence of the Commune to the Fall of the Republic in 1531. By T. Adolphus Trollope, Author of "The Girlhood of Catherine de Medici," &c. &c. In 4 vols., demy 8vo. 3*l.*

R. N. WORNUM.

SOME ACCOUNT OF THE LIFE AND WORKS OF HANS HOLBEIN, Painter, of Augsburg. With Numerous Illustrations. By Ralph Nicholson Wornum. Imperial 8vo. 1*l.* 11*s.* 6*d.*

"A more careful and elaborate record of the events in the career of any painter, and a more suggestive and able criticism on his works does not exist in our language; and it must certainly produce in the picture-loving world a more just estimate of one of that small class of painters who are really entitled to rank as 'the great masters.'"—*Pall Mall Gazette.*

THE EPOCHS OF PAINTING. A Biographical Essay on Painting and Painters of all Times and many Places. By Ralph Nicholson Wornum, Keeper of the National Gallery. Demy 8vo. 1*l.*

THE CHARACTERISTICS OF STYLES: an Introduction to the History of Ornamental Art. By Ralph Nicholson Wornum. Second Edition. Royal 8vo. 8*s.*

W. W. STORY.

ROBA DI ROMA. By William W. Story. Fifth Edition. In 2 vols., post 8vo. 12*s.*

THE PROPORTIONS OF THE HUMAN FIGURE, According to a New Canon. For Practical Use. By W. W. Story. Super-royal 8vo. With Plates. 10*s.*

ARTHUR DUKE COLERIDGE, M.A.

EGMONT, A TRAGEDY. By Goethe. Translated from the Original German (with entr' Actes and Songs by Beethoven, newly arranged from the full score, and Schubert's song, 'Freudvoll und Leidvoll,') by Arthur Duke Coleridge, M.A., late Fellow of King's College, Cambridge. With an Illustration by J. E. Millais, Esq., R.A. Crown 8vo. 8*s.* 6*d.*

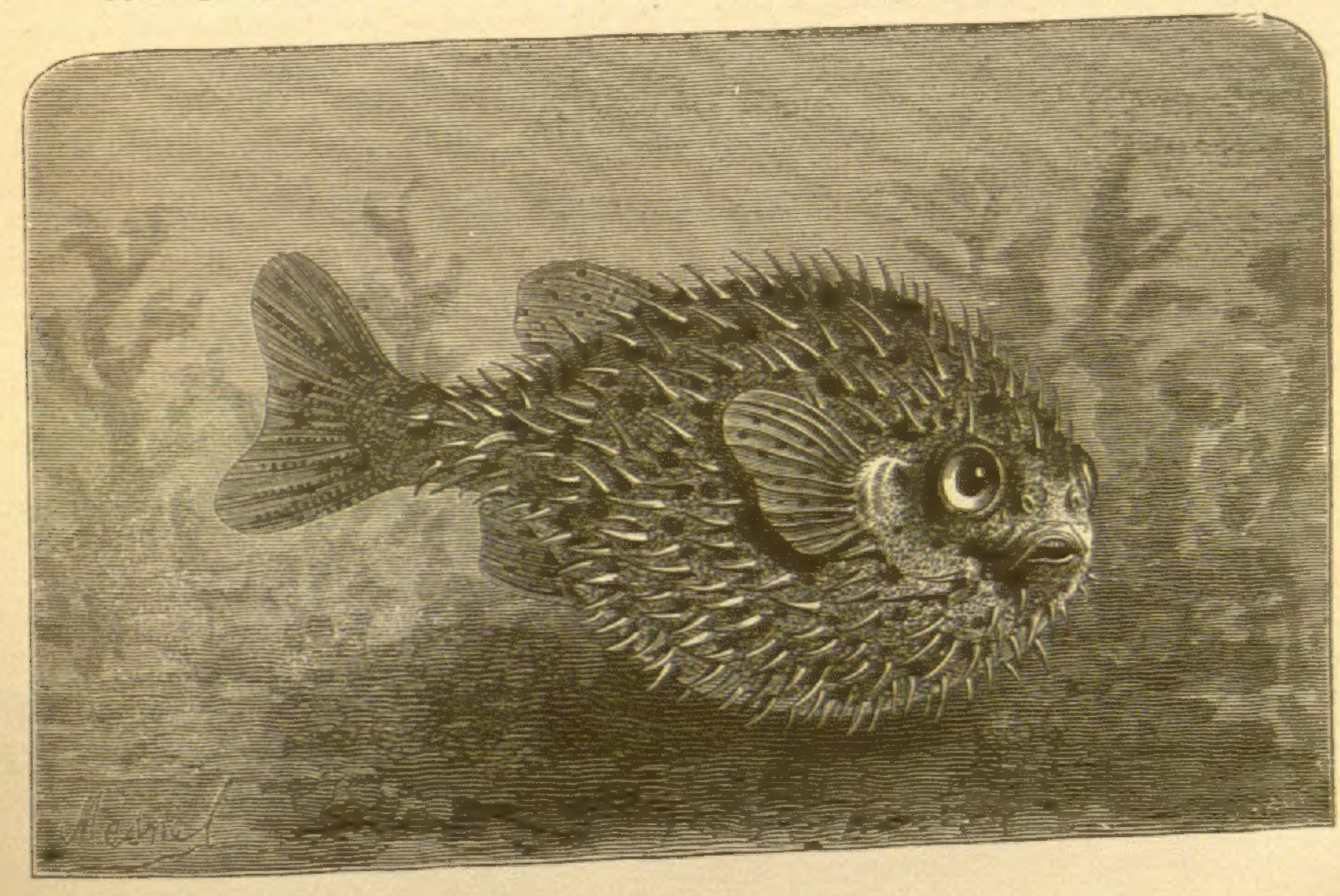
Fourth Thousand. In One handsome Volume, Demy 8vo., price 16*s*.

The Insect World. New Edition, revised and corrected

by E. W. JANSON, Libm. E.S. With 576 Illustrations.

Fourth Thousand, in One handsome Volume, Demy 8vo., price 16*s*.

The Ocean World. With 427 Illustrations.



CHAPMAN & HALL'S SERIES OF POPULAR AND STANDARD BOOKS. Strongly bound in Cloth. 5s. each.

BONES AND I; or, The Skeleton at Home. By J. G. Whyte-Melville. Crown 8vo. 5*s.* [*This day.*

CERISE; a Tale of the Last Century. By J. G. Whyte-Melville. Fourth Edition. Crown 8vo. 5*s.* With a Frontispiece.

THE BROOKS OF BRIDLEMERE. By J. G. Whyte-Melville. Crown 8vo. 5*s.* With a Frontispiece.

THE WHITE ROSE. By J. G. Whyte-Melville. Crown 8vo. 5*s.*

UNDER TWO FLAGS. A Novel. By "Ouida." Crown 8vo. 5*s.*

CHANDOS. A Novel. By "Ouida." Crown 8vo., with a Frontispiece. 5*s.*

STRATHMORE. A Novel. By "Ouida." Crown 8vo. 5*s.* [*This day.*

IDALIA. A Novel. By "Ouida." Crown 8vo. 5*s.*

CECIL CASTLEMAINE'S GAGE, and other Novelettes. By "Ouida." Crown 8vo. 5*s.*

THE SHAVING OF SHAGPAT. By George Meredith. Crown 8vo., with a Frontispiece. 5*s.*

ANASTASIA DOLBY.

CHURCH VESTMENTS: their Origin, Use, and Ornament practically Illustrated. By Anastasia Dolby, late Embroidress to the Queen. Fcap. 4to. 21*s.*

"The book gives one a wonderful notion of the wealth and time lavished, and the taste displayed n the making of the church vestments, and of the deep meaning and sentiment conveyed by the elaborate and beautiful productions which to uninstructed eyes appear merely masses of gorgeous material and colour. The execution of the illustrations with which the book is adorned is admirable, the clearness and minuteness of the designs being sufficient to enable them to serve as working patterns, and the combination of these designs with the Author's former work, which she alludes to in her preface as the 'pioneer' of this, form a complete manual of the most elevated school of church needlework."—*Morning Post.*

"We must not conclude without a word of commendation for Miss Dolby's elegant volume on Church Vestments, which examines in detail, with copious illustrations, the origin and proper manufacture of various articles of sacerdotal attire prescribed by the Roman ritual as used in England before the Reformation."—*Saturday Review.*

CHURCH EMBROIDERY, Ancient and Modern. Practically Illustrated. By Anastasia Dolby, formerly Embroidress to the Queen. Fcap. 4to. 12*s.*

"Eight designs for frontals and super-frontals are given, and the method of working them is carefully explained in detail, and the canopy is also provided for. Some of the mediæval designs here copied or imitated are of great beauty and effectiveness, and the monograms which succeed are also deserving of commendation."—*Church Times.*

"There is much to admire in the result of the lady's labours; her taste is good enough to lead her in the right direction; she understands the craft of the needle to perfection, and writes with the zeal of a mistress of the subject"—*Athenæum.*

OLIVER BYRNE.

THE YOUNG GEOMETRICIAN; or, Practical Geometry without Compasses. By Oliver Byrne. Royal 8vo. 10*s.*

CAPTAIN DRAYSON, R.A.

PRACTICAL MILITARY SURVEYING AND SKETCHING, with the Use of the Compass and Sextant, Theodolite, Mountain Barometer, &c. By Captain Drayson, R.A., &c., &c. Crown 8vo. 4*s.* 6*d.*

Fourth Thousand, in One handsome Volume, Demy 8vo., price 16*s*.

The Vegetable World: being a History of Plants, with their Botanical Description and peculiar Properties. By LOUIS FIGUIER. With 470 Engravings, chiefly drawn from nature by Mr. Faquet.

ITALIAN OR STONE PINE.

From ALL THE YEAR ROUND.

"A more welcome gift-book can hardly be conceived for growers possessed of moderate means; a portly volume, handsome without and full within, excellently and lavishly illustrated, with luxurious paper and legible type, copiously treating of a subject which interests young and old, rich and poor—a book which may be read again and referred to, after the first burst of curiosity is satisfied."

The SIXTH EDITION is now Ready.

Price 2*s*.

The FEBRUARY NUMBER of the

FORTNIGHTLY REVIEW.

Edited by JOHN MORLEY.

CONTENTS:—

On the Physical Basis of Life. By Professor Huxley.
The Prodigal: A Poem. By W. B. Scott.
The Woman of Business. By Marmion Savage.
Necker and Calonne: An Old Story. By E. S. Beesly.
Mr. Anthony Trollope's Novels. By J. H. Stack.
Schubert. By J. M. Capes.
The Suez Canal. By Captain Clerk.
On Chemical Rays, and the Light of the Sky. By Professor Tyndall.
Critical Notices. Some Books of the Month.

Just Published, price 12*s. cloth,*

THE TENTH VOLUME

OF THE

FORTNIGHTLY REVIEW.

EDITED BY

JOHN MORLEY.

The object of THE FORTNIGHTLY REVIEW is to become an organ for the unbiassed expression of many and various minds on topics of general interest in Politics, Literature, Philosophy, Science, and Art. Each contribution will have the gravity of an avowed responsibility. Each contributor, in giving his name, not only gives an earnest of his sincerity, but is allowed the privilege of perfect freedom of opinion, unbiassed by the opinions of the Editor or of fellow-contributors.

THE FORTNIGHTLY REVIEW is published on the 1st of every month (the issue on the 15th being suspended), price Two Shillings, and a Volume is completed every Six Months.

The following are amongst the Contributors:—

J. S. MILL.
Professor HUXLEY.
Professor TYNDALL.
GEORGE HENRY LEWES.
WALTER BAGEHOT.
Professor BEESLY.
FREDERIC HARRISON.
Professor HENRY MORLEY.
FREDERIC SEEBOHM.
A. C. SWINBURNE.
DANTE GABRIEL ROSSETTI.
HERMAN MERIVALE.
EDWARD A. FREEMAN.
MARMION SAVAGE.
A. GALLENGA.
WILLIAM MORRIS.
G. W. COX.
F. W. FARRAR.
W. KIRKUS.
MONCURE D. CONWAY.
Dr. ROWLAND WILLIAMS.
J. HUTCHISON STIRLING.
THE EDITOR.
&c. &c. &c.

CHAPMAN & HALL, 193, PICCADILLY.

PRINTED BY WM. CLOWES AND SONS, STAMFORD STREET AND CHARING CROSS.

The MAY NUMBER of the

FORTNIGHTLY REVIEW.

Edited by JOHN MORLEY.

CONTENTS:—

Mr. Thornton on Labour. By John Stuart Mill.
Mr. Lecky's First Chapter. By the Editor.
Notes on Shelley's Text. By A. C. Swinburne.
The Pacific Railroads. By W. A. Bell.
The Philosophy of Etching. By G. P. Hamerton.
Longman's Life and Times of Edward III. By E. A. Freeman.
The Woman of Business. By Marmion Savage.
Arbitration and Conciliation. By Henry Crompton.
Critical Notices.